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* General studies, see also individual crops.

PLANT BREEDING ABSTRACTS

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Plant Breeding Abstracts.

Vol. XI, No. 1.

Part 1. Empire Section

STATISTICS 519

1. YATES, F. 519.24
Modern experimental design and its function in plant selection.
Emp. J. Exp. Agric. 1940 : 8 : 223-30.

In this paper read at the 7th International Genetical Congress the advantage of testing a large number of varieties is pointed out and experimental designs making this possible are described, namely the simple lattice, the three-dimensional lattice, the triple lattice, the balanced lattice, balanced incomplete randomized blocks and the lattice square. References are given to papers in which the methods of computation are to be found.

2. KISHEN, K. 519.24:631.421
On a simplified method of expressing the components of the second order interaction in a 3^3 factorial design.
Sankhyā. Indian J. Statist. 1940 : 4 : 577-80.

If in a field experiment three different fertilizers (say N, P, and K) are applied to experimental plots it may be of interest to measure what is called the second order interaction between the three fertilizers. This may be regarded as a measure of how the presence of fertilizer P (say) affects the ordinary interaction between the two remaining fertilizers (N and K). Moreover, if such fertilizers are applied at three different levels it is sometimes of interest to study the law of diminishing returns by comparing the response difference to the highest and lowest level (linear response) with the curvature of the response curve.

In this paper the author considers the rather hair-splitting problem of calculating all second order interactions between the linear and curvature responses to the three fertilizers in a $3 \times 3 \times 3$ factorial design. Generalizing the method used by R. A. Fisher [The Design of Experiments, 1935 : pp. 124-37 (cf. "Plant Breeding Abstracts", Vol. VI, p. 207)] the author gives formal expressions for these interactions: they are given in terms of yield contrast between certain cyclically generated treatment combinations.

H. O. H.

3. KRISHNA IYER, P. V. 519.24:631.421
Symmetrical incomplete randomized blocks.
Proc. 27th Indian Sci. Congr., Madras 1940 : Pt III : Sect. Agric. : Abst. 58 : p. 231.

"By using the methods for forming orthogonal Latin squares, it has been shown that it is possible to write down the combinatorial solutions involved in the lay-out of symmetrical randomized block designs of p^n varieties, each block having p^s units".

4. KRISHNA IYER, P. V. 519.24:631.421
The analysis of simple non-symmetrical experiments.
Proc. 27th Indian Sci. Congr., Madras 1940 : Pt III : Sect. Agric. : Abst. 59 : 231-32.

"In the case of simple non-symmetrical experiments, in view of the fact that the least square estimates are not independent of one another, the usual method of judging the significance between the different varieties (or treatments) by the aid of the standard error of the mean difference is very laborious. In such cases it has been shown how by applying the principle of least squares a second time, a subsidiary analysis of variance table enabling the experimenter to classify the different varieties into groups can be drawn up. This procedure will give almost all the information that can be had by comparing the least square estimates. The method has been illustrated by working out an example in detail".

5. NAIR, K. R. 519.24:631.421
The application of the technique of analysis of covariance to field experiments with several missing or mixed-up plots.
Sankhyā. Indian J. Statist. 1940 : 4 : 581-88.

If data from field experiments are incomplete in that the yields of certain plots are missing or had to be rejected, the analysis of the experiment has to proceed on lines commonly known

as the "missing plot technique". If, on the other hand, the yields from different experimental plots get mixed up (and experimenters will agree that such mistakes will sometimes happen) the *total* yield from the mixed up plots is known so that more information is available. The appropriate analysis for such experiments has been developed by S. S. Bose and P. C. Mahalanobis and is called the technique of mixed up plots.

This paper is a further contribution to the analytical technique of both "missing plots" and "mixed up plots". Proceeding on lines recently introduced by Bartlett (analysis of covariance) the author is able to derive formulae for "the percentage loss of information" in experiments with one missing plot or two mixed up plots.

H. O. H.

6. SANT, G. K. 519.241.1:631.421
Some features in the analysis of covariance with split-plot designs.
 Proc. 27th Indian Sci. Congr., Madras 1940 : Pt III : Sect. Agric. : Abst. 57 : p. 231.

Field trials with cotton, using a split plot design and applying the covariance method to adjust crude yields for plant number have been carried out in Indore. The relative efficiency of the main plots and sub-plots was found to depend not on the number of sub-plots in each main plot, but on the uniformity of the field. Regression coefficients for main plots and sub-plots were comparable. The percentage reduction in the mean square due to adjustment for stand was more in the main plots than in the sub-plots. Variability of the relative efficiency of main plot to sub-plot was reduced appreciably by the adjustment. A possibility is indicated to predict the relative efficiency of main plot to sub-plot in the adjusted analysis of variance from those of the crude yields and stand.

S. E.

7. KALAMKAR, R. J. and 519.271.3:633.51.00.14
 DHANNALAL, L. A.
Sampling studies in a cotton varietal trial.
 Sankhyā. Indian J. Statist. 1940 : 4 : 567-76.

The authors describe an experiment on the comparative yields of five cotton varieties (Verum 434, Roseum, E.B.31, Verum 262 and Late Verum) carried out at the Agricultural College Farm, Nagpur. The varieties were replicated in four randomized blocks, each containing five plots (89' x 18'). Verum 434 and Verum 262 gave significantly higher yields than the remaining varieties and an analysis of covariance revealed that these yield differences were due to varietal differences in the number of surviving plants.

The ten plots of two of the blocks were used for a sampling investigation. Two sampling units (each being a five-foot length) were taken at random from each of four sub-plots of a plot, giving 80 sampling units in all. The estimation of the plot yield from the sample yield turned out to be rather inaccurate, but work is in progress to improve the sampling technique.

H. O. H.

BREEDING 575

8. HALL, D. 575:633
How the plant breeder goes to work: I, II.
 J.R. Hort. Soc. 1940 : 65 : 283-88, 327-33.

This article is the substance of a popular lecture delivered at the International Congress of Genetics, Edinburgh, 1939.

9. STOCKDALE, F. 575:633:551.566.1
The application of economic botany in the tropics.
 Trop. Agriculturist 1940 : 94 : 250-56.

This article has previously appeared in another journal, cf. "Plant Breeding Abstracts", Vol. X, Abst. 262.

10. CRANE, M. B. 575:635:575.125
Seed and food in war-time.
 J.R. Hort. Soc. 1940 : 65 : 321-26.

The problems of breeding self-pollinated and cross-pollinated vegetable crops are outlined. The possible use of hybrid vigour is also considered. Tests at Merton have shown that hybrid vigour can be utilized in tomatoes, some hybrids combining an appreciable increase in yield with early maturity.

GENETICS 575.1

11. PAL, B. P. 575.1
Genes: atoms of heredity.
 Indian Fmg 1940 : 1 : 270-73.

A popular article.

12. WEISS, F. E. 575.255
Masters memorial lectures, 1940. Graft hybrids and chimaeras: I, II.
 J.R. Hort. Soc. 1940 : 65 : 212-17, 237-43.

In these lectures a popular account is given of examples of supposed graft hybrids and of chimaeras. It is concluded that, with the possible exception of *Solanum Darwinianum*, all the supposed graft hybrids are periclinal chimaeras.

CYTOTOLOGY 576.3

13. DARLINGTON, C. D. 576.354.4
The prime variables of meiosis.
 Biol. Rev. 1940 : 15 : 307-22.

The basic type of meiosis differs from the basic type of mitosis, from which it may be supposed to have arisen, in the precocity of its prophase. Variations from the basic type of meiosis can be explained in terms of three prime variables, (i) the point at which the pairing chromosomes first make contact, (ii) the time available for pairing, (iii) the amount of torsion capable of being developed in the parts of the chromosomes which are paired. A co-ordination of these three variables is characteristic of stable species.

14. **Changing heredity of plants.** 576.356.5:581.04:633
 Indian Fmg 1940 : 1 : p. 33.

A brief note on the use of colchicine to induce polyploidy. Crops being experimented with in India in this way include chillies (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 618), wheat, tobacco, potatoes and gram (*Cicer arietinum*). S. E.

15. KOSTOFF, D. 576.356.5:581.143
The frequency of the cell division in polyploid plants.
 Curr. Sci. 1940 : 9 : 277-78.

It is pointed out that many diploids and F_1 hybrids have a shorter vegetative period than the corresponding experimentally produced tetraploids and amphidiploids. The growth curves of diploids and tetraploids are also different and it is suggested that this is due to tetraploids having different nuclear surface : nuclear volume ratios from those found in the corresponding diploids.

WHEAT 633.11

16. **Seventh Annual Report for the year 1939-40. Wheat Research Institute, Christchurch, New Zealand.** 633.11:575(93.1)
 Bull. Dep. Sci. Industr. Res. N.Z. 1940 : No. 84 : Pp. 26.

A rapid rise in the acreage grown of Cross 7 (cf. "Plant Breeding Abstracts", Vol. V, Abst. 861) has occurred—from 84 acres in 1934-35 to 100,000 acres in 1939-40. Two lines of Cross 31 (Tuscan x White Fife) have been further tested. It has been decided to distribute 31,05 under the name of "Fife Tuscan". This new variety has been bred to replace Tuscan, which it closely resembles, but it is thought that it may yield more highly than Tuscan. In variety trials Dreadnought was found to yield very heavily on the best class of wheat land, but it should only be grown in sheltered positions where there is no risk of loss from "shaking". The English wheat Holdfast promises distinct advantages for the better class of wheat land. Two advanced lines, 64,02 and 64,03, from the back-cross (Tuscan x Reward) x Tuscan, are promising as they possess a baking quality equal to Marquis, have shorter and stiffer straw, and are resistant to shaking. Other promising material is afforded by lines derived from Cross 77 (Tuscan x Jumbuck). These have the quality characteristics of Jumbuck but outyield Jumbuck and show no loss due to shaking.

17. WENHOLZ, H.,
 PRIDHAM, J. T.,
 VEARS, C. K. and
 CURTEIS, W. M. 633.11:575:007(94)

Wheat varieties in Australia.

Agric. Gaz. N.S.W. 1940 : 51 : 371-73, 397, 485-88.

Continuing this serial article (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 912 and Vol. X, Absts 15, 272, 602 and 936) brief notes are given on varieties in alphabetical order from Maclean to Nyngan. Special mention is made of the variety Nabawa (named in 1915) which is considered to be the most important variety since Federation. Nabawa shows a high resistance to flag smut and is a very high yielder. It was one of the parents of the variety Bencubbin which is now rapidly replacing it. Mention is also made of Mr R. Marshall, a practical farmer in South Australia, who produced Marshall's No. 3 (introduced in 1890) and Yandilla King. These two were among the leading varieties in Australia for over thirty years.

18. LOVE, R. M. 633.11:575.127.2:576.312.35:576.356
**Chromosome number and behaviour in a plant breeder's sample
 of pentaploid wheat hybrid derivatives.**

Canad. J. Res. 1940 : 18 : Sect. C : 415-34.

In this paper a full account is given of the cytological results of the author's study of 50 pentaploid hybrid derivative lines (cf. "Plant Breeding Abstracts", Vol. IX, Absts 680 and 681 and also Abst. 20 below).

The 336 plants studied could be divided into three categories: (1) plants comparatively stable cytologically; (2) plants with general irregularities; (3) plants with irregularities confined to one or a few specific chromosomes. The last type, with inversions, translocations, duplications or deficiencies may be useful to the plant breeder as a means of breaking the linkage between desired and undesired genes. The author also recommends more intensive study of hybrid derivatives used by the plant breeder and in the case of parent varieties, like Hope, Marquillo and R.L.729, which contain aberrant individuals he advocates the use of parent plants known to be stable cytologically.

19. RANJAN, S. 633.11:575.243:537.531:581.46
A preliminary note on the X-ray mutants of Pusa (52) wheat.

Proc. Indian Acad. Sci. 1940 : 12 : Sect. B : 62-66.

Young seedlings of Pusa (52) wheat were treated with X-rays. Eleven mutant types, 4 of which are awned and 7 of which are awnless, have been obtained.

20. PETERSON, R. F. and
 LOVE, R. M. 633.11-2.452-1.521.6:575.127.2
A study of the transference of immunity to stem rust from *Triticum durum* var. Iumillo to *T. vulgare* by hybridization.

Sci. Agric. 1940 : 20 : 608-23.

Forty-eight "Vulgare-like" lines and two "Durum-like" lines which were resistant to stem rust in 1936 were selected from F_4 , F_5 and F_6 generations of crosses between spring varieties of *Triticum vulgare* and *T. durum* variety Iumillo. These lines were grown on in 1937 and 1938 and most of them remained free from stem rust. Seedlings of the 50 selected lines and the parent varieties were also tested in the greenhouse with nine physiological races of stem rust. No line had the full immunity of the Iumillo parent but most of them were highly resistant. Chromosome numbers of the *Vulgare*-like lines ranged from 38 to 41, while the two *Durum*-like lines had 28 chromosomes. Morphological studies were made of 19 plant characters and from these a numerical estimate of "Vulgare-ness" of the lines was obtained. The *Vulgare*-like lines have a high "Vulgare-ness" but the value is not as high as that of the *Vulgare* parents. One of the *Vulgare*-like lines was crossed with Marquis and the F_2 grown in the field in 1939 under an artificially-induced stem rust epidemic involving at least 30 physiological races. Eleven out of 485 F_2 plants, all of which were of the *Vulgare* type, remained free from rust.

21. JOHNSON, T. and
NEWTON, M. 633.11-2.452-1.521.6:581.02
The influence of light and certain other environmental factors on the mature-plant resistance of Hope wheat to stem rust.
Canad. J. Res. 1940 : 18 : Sect. C : 357-71.

The mature-plant resistance of Hope, H.44-24 and new wheat varieties derived from crosses with them, although generally effective in N. America, has been known to break down in Peru and in Kenya. This might be due to different physiological races of rust present in these countries, but there is evidence that this is not so in Kenya. It was therefore thought that the break-down in mature-plant resistance might be caused by environmental factors (length of day, intensity of light, temperature, soil moisture, etc.). Greenhouse experiments have been made with Hope wheat to determine the effect of such environmental factors on mature-plant resistance. A 60% reduction in light intensity during the whole growing period made the plants softer and less rigid and also caused a small but not in most cases serious increase in susceptibility to stem rust. In one experiment with reduced light intensity, however, the reaction of the plants did approach complete susceptibility. Plants receiving 6 hours of light daily were less resistant than plants receiving 10 hours and these latter were more susceptible than plants receiving the full length of day. These changes in resistance with length of day were not serious. A constant high temperature of 75-80° F. caused a partial or even complete break-down in mature-plant resistance. Abundance of soil moisture and of mineral salts also caused some reduction in resistance.

OATS 633.13

22. 633.13:575.42(94.6)
The Cressy Research Farm. 1: General description and Algerian oat improvement work.

Tasm. J. Agric. 1940 : 11 : 117-21.

Single plant selections of stocks of Algerian oats have been carried out and an improved selection, A236, is to be distributed in the autumn of 1941 after five years' trials. A236 is especially superior to commercial stocks where the oat is grazed before being harvested for hay or grain.

RYE 633.14

23. KOSTOFF, D. 633.14:581.142:575.127.2
A case of vivipary in rye.
Curr. Sci. 1940 : 9 : 279-80.

Viviparous plants were found among the progeny of the back-cross (*Secale cereale* x *S. montanum*) x *S. cereale* in the F₈. The plants were only viviparous at relatively low temperatures (0-10° C.) and developed anthers and ovaries when kept at temperatures above 15° C.

MAIZE 633.15

24. SAUNDERS, A. R. 633.15:575(68)
Should we also take up hybrid maize? A full review of breeding methods and considerations which show that there would be serious snags in applying the American practice in South Africa. The Department's policy.

Fmr's Wkly, Bloemfontein 1940 : 59 : 1492-93, 1507.

It is suggested that the fact that only the first generation crop from hybrid seed is of commercial value means that in *S. Africa* there are serious obstacles in applying the American practice of hybrid maize. Instead the S. African Department of Agriculture is breeding new "synthetic types". Several hundred pure lines of high breeding value have been isolated and some of these have already been employed in the development of new types. The procedure adopted in combining many lines into a synthetic type is first to test single crosses, then to combine the best single crosses in double crosses of the type (a x b) x (c x d), and finally to mix equal quantities of seed from the double crosses for increase in isolation plots. By including a large number of lines, the genetic foundation of the synthetic type is widened and it is found that there is little reduction in yield from a synthetic type after the first generation.

25. MANGELSDORF, P. C. 633.15:576.16

Origin of maize.

Nature, Lond. 1940 : 146 : p. 338.

In this short note, the substance of a paper read at the Eighth American Scientific Congress, it is suggested that *Euchlaena* had a comparatively recent origin as the result of natural hybridization of *Zea* and *Tripsacum* and that maize originated as a mutation from a wild pod-corn once indigenous in the lowlands of South America. (Cf. "Plant Breeding Abstracts", Vol. X, Abst. 760).

26. SANSOM, T. K. 633.15-2.482-1.521.6:575(68.9)

Breeding *Diplodia* resistant varieties of maize.

Rhod. Agric. J. 1940 : 37 : 442-44.

Selections have been made from crosses between Johnson's County White, obtained from the U.S.A. and highly resistant to *Diplodia* attack, and Salisbury White, a good type of Rhodesian maize but highly susceptible to *Diplodia*. The new hybrid strain showed a *Diplodia* attack of 2-9% of grains as compared with about 50% in commercial seed. Further improvement of the variety is still in progress.

BARLEY 633.16

27. QUINCKE, F. L. 633.16:575.127.2:576.356.5

633.16:575.127.5:633.14

Interspecific and intergeneric crosses with *Hordeum*.

Canad. J. Res. 1940 : 18 : Sect. C : 372-73.

F_1 seeds, which were slightly shrunken and of which only 9% germinated, were obtained from the cross *H. jubatum* ($2n = 28$) female x *H. vulgare hex.* (variety Friedrichswerther) male. The F_1 plant had the perennial habit of the female parent but differed from the latter in several characters. F_1 hybrids, which were about twice as high as the female parent, were also obtained from the cross *H. jubatum* female x *H. vulgare dist.* (variety Rex). The cross *H. nodosum* ($2n = 42$) female x *H. vulgare dist.* (variety Hanna) produced F_1 plants which were much more vigorous than the female parent. Crosses were also attempted between *H. vulgare* (variety Friedrichswerther) and *H. jubatum* as female parents with *Secale cereale* (variety Crown) male. In the first cross it was found that fertilization of the embryo and endosperm nuclei took place but that development of both soon ceased so that very shrunken seeds were produced. Shrunken seeds without any traces of embryo or endosperm were also obtained in the second cross.

MILLETS AND SORGHUM 633.17

28. RANGASWAMI AYYANGAR, G. N. and 633.174:575.11:581.46

VENKATARAMANA REDDY, T.

The inheritance of hairy styles (and barbed columns of awns) in sorghum.

Curr. Sci. 1940 : 9 : 282-83.

Hairy styles and barbed columns of awns were found to be caused by a single dominant gene in the cross A.S.4249 (*S. cernuum* Host) x A.S.29 (*S. durra* Stapf), the latter species having the recessive characters smooth stylar arms and smooth columns of awns.

29. RANGASWAMI AYYANGAR, G. N. and 633.174:575.11:581.46

VENKATARAMANA REDDY, T.

Sorghum - awns of inconstant length and their inheritance.

Curr. Sci. 1940 : 9 : 283-84.

Most awned cultivated sorghums have awns which are more or less constant in length (a fluctuation of about 2 mm.) within a variety. *S. guineense* Stapf, however, shows an inconstant awn length, the lengths ranging from 1 to 9 mm. even in a single earhead. A natural cross was found in Family No. A.S.4143 of *S. coriaceum* Snowden (which has normal type of awns) with *S. guineense* as male parent. The F_2 of this cross segregated for awn length, the range being from 1 to 15 mm. and, scoring only those plants with awns longer than 5 mm., it was also found that 126 had awns of constant length in a panicle and 41 of inconstant length. Inconstant length of awn thus appears to be a simple recessive to the normal type. F_3 data also supported this conclusion.

RICE 633.18

30. DIXIT, P. D. 633.18:575(54.1)
Some improved paddy varieties for dalua cultivation in Orissa.
 Proc. 27th Indian Sci. Congr., Madras 1940 : Pt III : Sect. Agric. : Abst. 24 : p. 217.
 Selections from the Japanese variety, Orosporzose, and some of its natural crosses have been found to be distinctly superior to the commonly cultivated dalua or summer paddy varieties. B. P. P.

31. NANDI, H. K. and GANGULI, P. M. 633.18:575.11.061.6:581.46
Inheritance of the colour of lemma and palea in rice. II.
 Proc. 27th Indian Sci. Congr., Madras 1940 : Pt III : Sect. Agric. : Abst. 32 : p. 221.
 Factorial analysis of the yellow-glumed plants referred to in "Plant Breeding Abstracts", Vol. VIII, Abst. 330, has shown them to include the following homozygous types: $B_1B_1b_2b_2YY$, $b_1b_1B_2B_2YY$ and $b_1b_1b_2b_2YY$. S. E.

32. NANDI, H. K. and GANGULI, P. M. 633.18:575.11"793"
Inheritance of the flowering character in rice.
 Proc. 27th Indian Sci. Congr., Madras 1940 : Pt III : Sect. Agric. : Abst. 33 : p. 221.
 In crosses between summer and autumn rices the F_1 hybrids were more or less intermediate but nearer the early parent. The F_2 segregation suggested that multiple genes were concerned. In crosses between autumn and winter rices and between summer and winter rices, the F_1 plants were intermediate. The F_2 in the former case however showed transgressive segregation on both sides while in the latter the transgression was one sided, i.e. towards lateness only. B. P. P.

33. PARIJA, P., DIXIT, P. D. and CHALLAM, G. V. 633.18-2.181.1-1.521.6:519.241.1
Some anatomical peculiarities in the stem of some flood resistant paddy selections.
 Proc. 27th Indian Sci. Congr., Madras 1940 : Pt III : Sect. Agric. : Abst. 30 : p. 220.
 Most of the flood resistant paddy selections were characterized by the presence of a semilunar sclerenchymatous band, one to two cells in thickness, around the cortical lacunae. B. P. P.

LEGUMINOUS FORAGE PLANTS 633.3

34. STEVENSON, T. M. and WHITE, W. J. 633.366:581.192:575.11:581.6
Investigations concerning the coumarin content of sweet clover. I. The breeding of a low-coumarin line of sweet clover *Melilotus alba*.
 Sci. Agric. 1940 : 21 : 18-28.
Inter alia it is shown that while there are considerable differences among plants with high or with low coumarin content, there is a fairly clear distinction between the two main types and that this is governed by a single pair of factors. Low coumarin content is recessive. (Cf. also Herbage Abstracts, Vol. X, Abst. 1573).

ROOTS AND TUBERS 633.4

35. SALAMAN, R. N. 633.491:575
The biology of the potato. With special reference to its use as a prime war-time food.
 Chem. Ind., Lond. 1940 : 59 : 735-37.
 Mention is made of the important variant characters of the potato such as maturity, tuber shape and colour, quality and disease resistance and of the genes controlling these characters.

36. PAL, B. P. and
PUSHKAR NATH. 633.491:575(54.5)
The Simla Potato Breeding Station.
Indian Fmg 1940 : 1 : 25-28.
An account of the potato breeding work in progress at the Simla Potato Breeding Station.
J. G. H.

37. BALLS, E. K. 633.491-1.524
Expedition to the Andes, 1938-1939.
J.R. Hort. Soc. 1940 : 65 : 289-95.
BALLS, E. K.
Potatoes and other plants in the Andes.
Gdnrs' Chron. 1940 : 107 : 9-10, 128-29; 108 : 52-53, 100-01.
These articles give a general account of a potato-collecting expedition to South America organized by the Imperial Agricultural Bureaux. Very little mention is made of the potato collecting and the articles deal mainly with species which might make good garden plants.

FIBRES 633.5

38. ABRAHAM, P. 633.51:575.127.2:576.354.4
Cytological studies in *Gossypium*. I. Chromosome behaviour in the interspecific hybrid *G. arboreum* x *G. Stocksii*.
Indian J. Agric. Sci. 1940 : 10 : 285-98.
Meiosis was studied in *G. arboreum* ($n = 13$), *G. Stocksii* ($n = 13$) and in the sterile hybrid between these two species. The parent species form 13 bivalents regularly. The hybrid forms from 5 to 9 bivalents with a mean of 7 bivalents per nucleus. The chiasma frequency per bivalent in the hybrid is less than the parental and the first division spindle is also highly irregular. From the meiotic results it is suggested that six of the thirteen chromosomes of *G. Stocksii* had an entirely different origin from those in other Old World cottons.

39. AMIN, K. C. 633.51:575.127.2:581.162.5
Interspecific hybridization between Asiatic and New World cottons.
Indian J. Agric. Sci. 1940 : 10 : 404-13.
Twenty-three F₁ hybrids have been obtained from very many attempts to cross diploid Asiatic cottons with tetraploid New World cottons. Of these hybrids, 19 are triploids ($2n = 39$), 1 is tetraploid ($2n = 52$) and another is pentaploid ($2n = 65$). All the hybrids showed hybrid vigour, were almost completely sterile and in most characters were intermediate between the two parents. Back-crossing to New World cottons has been successful, particularly when the tetraploid hybrid was used as one parent. One plant in the first back-cross population was found to be fully fertile.

40. ABRAHAM, P. 633.51:576.312.34
Morphology of the somatic chromosomes of three Asiatic cottons.
Indian J. Agric. Sci. 1940 : 10 : 299-302.
The chromosome morphology of the three Asiatic cottons, *G. Stocksii*, *G. arboreum* var. *neglectum* forma *indica* and *G. herbaceum* var. *frutescens* was examined. All three species have a chromosome number of $2n = 26$ and all have two pairs of satellite chromosomes. The total length of the chromosome complement of *G. herbaceum* was found to be greater than that of *G. Stocksii* and *G. arboreum*, the length in the latter two species being similar. Differences in thickness were also observed. The chromosomes in any set could be classified by size and by position of attachment constrictions.

41. SINGH, A. 633.52:576.312.35
Cytology of *Linum* spp.
Proc. 27th Indian Sci. Congr., Madras 1940 : Pt III : Sect. Bot. : Abst. 37 : p. 140.
The somatic chromosome numbers of *L. usitatissimum* and *L. grandiflorum* are given as 30 and 16 respectively. Somatic division and microsporogenesis in the two species are described.
B. P. P.

SUGAR PLANTS 633.6

42. WILLIAMS, C. H. B. 633.61:575(88)
The variety and fertiliser position of the sugar industry, VI.
 Sug. Bull. Dep. Agric. Brit. Guiana 1940 : No. 9 : 55-62.
 P.O.J.2878 and Diamond 10 occupy respectively 57.6% and 37.1% of the acreage to be reaped in 1940. D.625 occupies only 2.8%, other canes 1.9% and mixed canes 0.6%. The varietal trends since 1934 show a steady decline in acreage of D.625, a rise in Diamond 10 up to 43.5% in 1939, a steady rise in P.O.J.2878 and a decline in the "mixed" area from 12.7 in 1936.

43. WILLIAMS, C. H. B. and 633.61:575(88)
 CAMERON, C. 633.61.00.14(88)
Field experiments with sugar cane, IX.
 Sug. Bull. Dep. Agric. Brit. Guiana 1940 : No. 9 : 1-54.
 From the account of the sugar cane variety trials conducted in the year ending June 30, 1940, the following notes on new varieties bred in British Guiana are drawn.
 D.419/33 (Co.281 x Diamond 10) has been highly satisfactory in respect of both tonnage and juice quality. Its total yield of sucrose for plant cane and first and second ratoons is about one-third higher than that of P.O.J.2878. So far it has been reaped thrice as plant canes, twice as first ratoons and once as second ratoons. D.30/33 (S.C.12.4 x Diamond 10) and D.8/33 (D.53/27 x Diamond 10) have only appeared so far in one experiment each. Their cane is equal in quality to that of P.O.J.2878 and their yield about the same; they will be tested further. D.24/33 (S.C.12/4 x Diamond 10) has given very uneven results so far. D.7.5/30 (Badila x D.625) is slightly superior to Diamond 10 and slightly inferior to P.O.J.2878 in yield of sugar over three crops. D.49/30 (a D.625 seedling) which yields cane of high quality is equal in yield over three crops to Diamond 10 but in some places it is better. D.67/30 (Diamond 10 x S.C.12.4) also appears to be about equal to Diamond 10 in yield and has satisfactory juice.
 D.150/30, D.34/33 and D.39/33 are to be discarded.
 It is mentioned that sugar cane breeding and experimental work were badly affected by a severe and prolonged drought during the year under review, 1939-40.

44. 633.61:575(94.3)
Cane breeding.
 Aust. Sug. J. 1940 : 32 : 251-54.
 After a very brief outline of early sugar cane breeding work in Queensland, the present routine is described.
 Cross pollination work is done in the Cairns district, cut canes standing in weak sulphurous and phosphoric acids in isolation being used. The fuzz is brought to Mackay for planting and can be stored for short periods by keeping it cool and dry. About 6,000 or 7,000 seedlings are raised each year, and about 75 are selected on appearance. The selected seedlings are planted in early spring in plots of four rows of 10 plants and notes are taken on coverage, growth characteristics and sugar content. After a further twelve months about 15 seedlings are selected and grown in plots of 1/20 acre with control plots of a well known standard cane. At the end of another year about four seedlings are selected for plant cane and ratoon trials both on the station and on farms. These seedlings are given a Q. number and in the meantime have been tested for disease resistance.
 The best seedlings for Mackay conditions have had P.O.J.2878 or its relatives as one parent, but these Java canes unfortunately transmit susceptibility to downy mildew. The best seedling raised so far, C.83, cannot be released because of its susceptibility to downy mildew. Steps are being taken to reduce the incidence of the disease to the point where it will be safe to release susceptible varieties.
 The only variety so far released from the Mackay Station is Q.20, with fairly strong ratooning and resistance to downy mildew. The seedling Q.28 (Co.290 x Q.1098) is going out on farm trials this year; it is a vigorous seedling but not very high in sugar. The seedlings Jason and Comus may also be tested on farms this year. They are both resistant to downy mildew but Comus may be susceptible to mosaic and Jason suffers from free arrowing and stiff hairs on the leaf sheath.

45. KING, N. J. 633.61:575(94.3)

Seedling raising at Bundaberg and some notes on Q.25.

Cane Gr. Quart. Bull. 1940 : 8 : 29-32.

At the Bundaberg Experiment Station, where some 350 sugar cane seedlings were first raised in 1930, 6,000 seedlings are now grown per year. Also in 1940 for the first time a locally produced seedling, Q.25, has been distributed to growers. Q.25, whose parents were P.O.J.2875 as female and H.Q.409 as male, is resistant to gumming and downy mildew but susceptible to mosaic and Fiji. Its resistance to downy mildew is considered to be its principal virtue but it has also yielded well in preliminary trials. Q.25 is not yet, however, on the approved list.

46. BHAGAVANTHI KUTTY AMMA, P. R. and 633.61:575.127.5:633.289:575.11
EHAMBARAM, T.**Sugarcane x bamboo hybrids.**

J. Indian Bot. Soc. 1940 : 18 : 209-29.

The morphology and the anatomy of 18 F_1 plants, of 300 F_2 plants obtained by open-pollinations and of 12 back-cross seedlings with the bamboo from the cross sugar cane (P.O.J.213) female x bamboo male have been examined. The results showed that the hybrids were genuine, since certain of their characters could only have been derived from the bamboo parent. On the other hand it was found difficult to distinguish the hybrids from sugar canes in the field since in appearance and growth form the hybrids were similar to sugar cane. Details of the inheritance of morphological and anatomical characters are given in tables and were found to be rather complex, especially as groups of characters forming any one morphological or anatomical unit in the parents were often split up in the hybrids.

47. DUTT, N. L. and 633.61:581.143.26.035.1:575.12
KRISHNASWAMI, M. K.**A note on photoperiodism experiments on sugarcane at Coimbatore.**

Proc. 27th Indian Sci. Congr., Madras 1940 : Pt III : Sect. Agric. : Abst. 47 : 227-28.

Curtailing daylight to six hours hastened flowering in P.O.J.2725 by 14 days and in C.O.290 by 26 days. Increasing the daylight retarded flowering and if continued for a long period, even inhibited it. By applying these results it has been possible to make crosses between varieties that normally do not flower at the same time.

B. P. P.

48. PETO, F. H. and 633.63:576.356.5:631.557:581.6
BOYES, J. W.**Comparison of diploid and triploid sugar beets.**

Canad. J. Res. 1940 : 18 : Sect. C : 273-82.

By colchicine treatment of diploid sugar beet stocklings, tetraploid branches were obtained and left to be open-pollinated. The polyploid progeny of these branches consisted of 69 triploids and 2 tetraploids. Fifty-six triploids and the same number of diploids were compared. In both diploids and triploids there was a negative correlation between individual beet weight and sugar percentage, but in the triploid the slope of the regression line is less steep so that the largest triploid beets have a higher sugar percentage than diploids of a corresponding weight. Comparisons of diploids and triploids on a plot basis showed that the mean root weight of triploids is significantly higher than that of diploids and that the percentage sugar contents of both forms are similar. Similarly the dry top weight of the triploids is larger and the percentage moisture in tops similar in both forms. The leaf area and stomatal dimensions of triploids were also found to be higher than those of diploids.

STIMULANTS 633.7

49. EDEN, T. 633.72:575(54.8)

Report of the plant physiologist for 1939.

Bull. Tea Res. Inst. Ceylon 1939 : No. 21 : 47-52.

In the report of the plant physiologist details are given of the selection work at St. Coombs. From approximately 2,500 bushes selected in the field for size and vigour of growth 38 possible clone mother bushes have been chosen. The rejection scheme is outlined and it is shown

that no information of value is lost by stringent rejection. On the average only 2% of the bushes placed under trial are outstanding in yield. Selected bushes are also being examined for quality.

50. **NARASIMHA SWAMY, R. L.** 633.73:575.11.061.6
Genetical studies in *Coffea arabica* L. A preliminary study with young leaf colour and ripe pericarp colour.
 Indian J. Agric. Sci. 1940 : 10 : 414-21.

Observations have been made upon the inheritance of young leaf colour and of pericarp colour of ripe fruits in progenies of *C. arabica* seedlings obtained by controlled pollinations. All plants with copper and brown leaves were found to have red pericarp and plants with light green leaves have golden-yellow pericarp. Plants homozygous for copper and light green leaves have been found but all the brown leaf plants used were heterozygous. Progenies of some copper leaved plants show segregations into copper and brown and some light green leaved plants have progenies containing light green and brown leaved plants. These two types of segregation suggest that copper leaves are a simple dominant to light green and that light green leaves are a simple dominant to brown. Progenies of plants with brown leaves, however, have shown segregations into plants with copper, brown and light green leaves. Nevertheless from crosses between plants with copper and green leaves, copper would appear to be dominant to green leaves as well as to brown.

51. **VOELCKER, O. J.** 633.74:581.162.32
The degree of cross pollination in cacao in Nigeria.
 Trop. Agriculture, Trin. 1940 : 17 : 184-86.

Controlled pollinations showed that yellow pod cacao trees produced seedling progenies with no axil spot when selfed and progenies containing about 50% of seedlings with axil spot when crossed with red pod trees. Examination of the progenies obtained from natural pollination of three yellow pod trees, which were surrounded by red pod trees, showed that about 25% of the progeny on any Nigerian cacao tree are produced as the result of cross-pollination, provided that the tree is uniformly surrounded by others. It is also concluded that pollen is unlikely to be carried from beyond immediate neighbouring trees.

52. **COPE, F. W.** 633.74:581.162.5:581.331.1
Studies in the mechanism of self-incompatibility in cacao. II.
 9th Rep. Cacao Res., Trinidad (1939) 1940 : 19-23.

As has been previously reported (cf. "Plant Breeding Abstracts", Vol. X, Abst. 49), the failure of self-pollinations on a self-incompatible cacao tree was not due to a reduction in growth rate of the pollen-tubes in the style. Fertilization also occurs at a similar time in both compatible and incompatible matings. Post-fertilization differences in embryo-sacs of the two types of mating have, however, now been observed. Division of the polar nucleus occurs considerably later in incompatible matings so that at the time when the flowers absciss in such matings less than 25% of the embryo-sacs have undergone the primary polar division (the corresponding figure for compatible matings is over 80%). It is also suggested that the high level of activity of the embryo-sac in compatible matings causes the non operation of the abscission mechanism.

53. **COPE, F. W.** 633.74:581.162.5:631.557
Some factors controlling the yield of young cacao. III.
 9th Rep. Cacao Res., Trinidad (1939) 1940 : 6-12.

This is a further report of the work described in "Plant Breeding Abstracts", Vol. X, Abst. 50. Flowering intensity, number of cherelles set and percentage of cherelles wilting for both self-compatible and self-incompatible cacao trees are compared for a favourable year (1937-38) with an unfavourable year (1938-39). Self-compatible trees yielded better in both years. The most important factor in reducing yield for both types of tree in an unfavourable year is the higher percentage wilting of cherelles.

54. **SALMON, E. S.** 633.79.00.14:581.6(42)
Twenty-third report on the trial of new varieties of hops, 1939.
 J. Inst. Brew. 1940 : 46 : 367-75.

Details are given of the yields, resin contents and parentages of a large number of new hop varieties. Five of the new varieties OB.53 (Nonsuch), Q.43 (Bullion), C.9a (Brewer's Gold),

BB.28 and H.44 were richer in preservative qualities than the richest sample of American hops obtainable.

AROMATIC PLANTS 633.8

55. RAGHAVAN, T. S. and VENKATASUBBAN, K. R. 633.842-1.524;576.312.35 633.842;575.243;537.531;576.356

Studies in the South Indian chillies. I. A description of the varieties, chromosome numbers and the cytology of some X-rayed derivatives in *Capsicum annuum* Linn.

Proc. Indian Acad. Sci. 1940 : 12 : Sect. B : 29-46.

The chromosome number of $2n = 24$ was found for a number of varieties of South Indian chillies. These varieties are described and they are all placed in the species *C. annuum*. Seeds of a pure line were treated with X-rays and six mutants were isolated for further study. Meiosis has been studied in a normal plant and in a semi-sterile mutant. Asynapsis, fusion of second division plates and cytomixis were observed in this mutant.

OIL PLANTS 633.85

56. SIKKA, S. M. 633.853.49;575.127.2;576.354.4
633.853.49;576.353;576.312.315

Cytogenetics of *Brassica* hybrids and species.

J. Genet. 1940 : 40 : 441-509.

Meiosis and mitosis have been studied very thoroughly in a number of *Brassica* species and hybrids. The hybrid *B. juncea* Coss. ($n = 18$) x *B. campestris* L. var. *sarson* Prain ($n = 10$) always forms at meiosis 10 bivalents and 8 univalents, thus suggesting that *B. juncea* is an amphidiploid species, one of whose parents is *B. campestris*. *B. juncea* itself forms occasional quadrivalents and univalents. The hybrid *B. Tournefortii* Gouan ($n = 10$) x *B. trilocularis* H.f.T. ($n = 10$) formed at meiosis a few bivalents (never more than 3), often one quadrivalent or trivalent, and a large number of univalents. Other meiotic irregularities such as supernumerary spindles and restitution nuclei were also observed in this hybrid. Meiosis in the hybrid *B. trilocularis* ($n = 10$) x *B. rapa* L. ($n = 10$) was quite regular, 10 bivalents being regularly formed. The chromosome numbers of the following species were determined either from root tip counts or from pollen mother cells—*B. sinapistrum* Bois, $2n = 18$; *B. Tournefortii* Gouan, $2n = 20$; *B. monensis* Huds., $2n = 24$; and *B. rugosa*, $2n = 38$. The relation between the number of satellites and the number of nucleoli was investigated for nine species. *B. oleracea* ($2n = 18$) and the species with $2n = 20$ have two satellites and two nucleoli, while *B. nigra* ($2n = 16$) has four satellites and four nucleoli. *B. napus* and *B. rugosa* ($2n = 38$ in both species) have four nucleoli and this fact supports the view that *B. napus* is an amphidiploid species whose parents are *B. oleracea* and a 20-chromosome species. *B. juncea* ($2n = 36$) has six satellites and six nucleoli, thus supporting the suggestion that it is an amphidiploid species from *B. nigra* (four nucleoli) x *B. campestris* (two nucleoli). It is also suggested from these studies, particularly from the occurrence of four nucleoli in *B. nigra*, that the basic chromosome number of *Brassica* is $b = 5$ (further evidence for a basic number of 5 was also obtained in the secondary association studies given later) and that the monogenic species, i.e. those with $n = 8, 9$ or 10 , may have had a common origin. Somatic pairing was also observed in root tips and a few bridges were seen in somatic divisions. From the study of secondary associations at meiosis the following haploid chromosome complements were suggested *B. monensis*, AAAA BBB CC DD E; *B. sinapistrum*, AA BB CC DD E and *B. nigra*, AA BB CC D E. Meiosis was also studied in *B. Wrightii* n. comb. ($2n = 24$) and was found to be rather irregular. One quadrivalent was very commonly observed and in three cells an octavalent was seen.

57. ALI MOHAMMAD and SIKKA, S. M. 633.853.49;575.127.2;581.163
633.42;575.127.2;581.163

Pseudogamy in genus *Brassica*.

Curr. Sci. 1940 : 9 : 280-82.

Attempts were made to produce crosses using the following species—*B. campestris* L. var. *sarson* Prain ($2n = 20$), *B. Tournefortii* Gouan ($2n = 20$), *B. juncea* Coss ($2n = 36$), *B. nigra* Koch ($2n = 16$) and *B. campestris* L. var. *dichotoma* Prain ($2n = 20$). True hybrids were

obtained in two crosses only between *B. juncea* as female parent and *B. campestris* var. *sarson* and var. *dichotoma* as male parents. Maternal hybrids, which it is suggested are formed by pseudogamy, were obtained in several other crosses.

58. SIKKA, S. M. 633.853.49:576.312.35:576.16
Species formation and economic utility of amphidiploids in Brassica. 633.853.49:575.129
 Proc. 27th Indian Sci. Congr., Madras 1940 : Pt III : Sect. Agric. : Abst. 34 : p. 221.

The genus *Brassica* consists of species with an aneuploid series of chromosome numbers. The basic number of chromosomes for the genus has been determined to be 5 from a study of secondary association of chromosomes in three species, viz. *B. monensis* ($2n = 24$), *B. sinapistrum* ($2n = 18$) and *B. nigra* ($2n = 16$). This finding is supported by the occurrence of related genera with chromosome numbers in multiples of 5.

Species differentiation due to amphidiploidy is another line of evolution in *Brassica*. *B. juncea* ($2n = 36$) is shown to be an amphidiploid derivative of a cross between *B. campestris* ($2n = 20$) and *B. nigra* ($2n = 16$).

Structural changes like segmental interchange and inversion are also inferred to have played a part in evolution from a study of the cytology of interspecific hybrids.

Amphidiploid *B. juncea* is self-fertile and yields more than the elemental species from which it originated. The author, therefore, stresses the importance of producing new amphidiploids in *Brassica* for economic purposes.

B. P. P.

59. RAMANUJAM, S. 633.853.49:576.356.5
Autotriploidy in toria (Brassica campestris L.).
 Curr. Sci. 1940 : 9 : 325-26.

Two triploid plants have been found in two different cultures of toria (*Brassica campestris* L.). They were recognized by being bigger than the diploids. The triploids formed a varying number of trivalents in P.M.C.'s at meiosis.

60. DESHPANDE, R. B. 633.854.797:575.242:575.11
A sterile mutant in safflower (Carthamus tinctorius L.).
 Curr. Sci. 1940 : 9 : 370-71.

Abnormal plants with thick and twisted stems and producing a single, solitary, terminal capitulum, which did not open and failed to set seed, were found in the selfed progeny of the variety I.P.I. The observed ratios of abnormal to normal plants suggest that the abnormal condition is a simple recessive.

MEDICINAL PLANTS 633.88

61. PANTULU, J. V. 633.88:576.312.35
A note on the chromosome numbers of Cassia.
 Curr. Sci. 1940 : 9 : 416-17.

The chromosome number of both *C. occidentalis* and *C. auriculata* was found to be $n = 14$.

RUBBER PLANTS 633.91

62. FORD, C. E. 633.912:575
Planting material.

2nd Quart. Circ. Ceylon Rubb. Res. Scheme 1940 : 17 : 142-58.

In this paper given at a rubber conference organized by the Planters' Association of Ceylon, the history of plant improvement in Hevea and the relative merits of buddings and seedlings as planting material are discussed. Finally, recommendations for planting material, both clones and seedlings, in 1940 are given.

63. MURRAY, R. K. S. 633.912:575(54.8)
 633.912:576.3:578.08

Report of the botanist and mycologist for 1939.

Report of the Work of the Rubber Research Board in 1939 : Ceylon 1940 : 48-71.

Studies on Ceylon clones have been continued and the testing of certain clones has now reached a stage at which it is desirable for rapid multiplications to be effected. The breeding

investigations consisted of making 2,565 artificial pollinations during the 1939 flowering season. One hundred and eight fruits were harvested from these pollinations and from them 199 seedlings were raised. Considerable attention has been devoted to cytological technique and the root tip smear method has been developed for somatic counts. Nine pairs of natural twins were found in the 1938 and 1939 seedlings, but all plants were diploids.

64.

633.912-1.524(42)

Wickham did not "smuggle" *Hevea* seeds from Brazil.

Rubb. Res. Inst. Plant. Bull. 1940 : No. 12 : 12-13.

De overbrenging van Heveazaden uit Brazilië naar Engeland in het jaar 1876 door Henri A. Wickham. (**The conveyance of *Hevea* seed from Brazil to England in the year 1876 by Henry A. Wickham**).

Bergcultures 1940 : 14 : p. 609.

There is probably no truth in the well known stories that Sir H. A. Wickham had to smuggle the first *Hevea* seeds out of Brazil in 1876. It was only in relatively recent times that the exportation of *Hevea* seeds was prohibited in the states of Pará and Amazonas, a measure of little use since seeds could still be exported from the state of Matto Grosso or from Bolivia. Wickham may, however, have resorted to special measures to expedite the shipping of the seeds since they would have died if not got to England quickly.

In the second article a document in the Museum of Commerce at Belem (Pará) is cited as showing that the prevailing view that illegal methods were used in getting the seed from Brazil to England is false.

NUTS 634.5

65. PATEL, J. S. 634.58:575(54.8)
Groundnut in Madras.
 Proc. Ass. Econ. Biol. 1938 : Pp. 5.

In this account of groundnut cultivation in Madras, mention is made of the different varieties which have been introduced. Groundnut breeding is now carried out by the Madras Department of Agriculture. The range of the variability available to the plant breeder is outlined. A mass selection, A.H.25, was distributed in 1934 and gave an average increase in yield over local varieties of 25%. New selections show a yield increase of about 12% over A.H.25. So far planned crosses have not been successful in producing higher yielding types than those obtained by selection but new types have been produced by hybridization. Dormancy in the field has been found to be caused by a single dominant gene, germination of pods before they are fully mature being recessive.

PALMACEOUS AND OTHER TREE FRUITS 634.6

66. CHAUDHURI, K. 634.65:576.312.35
A note on the morphology and chromosome number of *Litchi chinensis* Sonner.
 Curr. Sci. 1940 : 9 : p. 416.

The chromosome number of *L. chinensis* was found to be $n = 14$.

FORESTRY 634.9

67. HELMS, A. D. 634.97:575(48.9)
A visit to the Danish arboretum and forest botanical gardens, June, 1939.
 Aust. For. 1940 : 5 : 16-20.

Much of the work of the arboretum is concerned with forest genetics and the visitor saw hybrids between Japanese and European larch, between *Abies Lowiana* and *A. grandis*, a fast growing poplar hybrid, *Populus vernirubens*, as well as a triploid aspen, a triploid alder (*Alnus cordata* x *A. subcordata*, the latter parent being in this case a tetraploid) and a triploid larch from the cross between *Larix decidua* and *L. occidentalis*.

Colchicine and X-rays are being used in attempts to induce polyploidy. Curly birch selections are being propagated by grafting. The technique of vegetative propagation is being improved and also that of artificial pollination. Old material of conifers grafted to young stock flowers readily and so pollination can be done at ground level instead of at the top of a tree as previously.

VEGETABLES 635

68. SALAMAN, R. N. 635.24-1.524
Why "Jerusalem" artichoke?
 J.R. Hort. Soc. 1940 : 65 : 338-48, 376-83.
 An account of the introduction of *Helianthus tuberosus* and of the history of its several European names.

69. HOWARD, H. W. and 635.561:576.356.5:575.127.5
 MANTON, I.
Allopolyploid nature of the wild tetraploid watercress.
 Nature, Lond. 1940 : 146 : 303-04.

The wild tetraploid watercress (cf. "Plant Breeding Abstracts", Vol. V, Abst. 1141) was previously thought to be an autopolyploid. By treating diploid seedlings with 0.5% colchicine solution true autotetraploids have now been produced and these lack the slow growth, straggling habit and details of fruit shape noted in the wild tetraploids. At meiosis in different types the following configurations were observed:—diploid 16_{II}, wild tetraploid 32_{II}, hybrid between diploid and wild tetraploid 16_{II} + 16_I; the autotetraploid forms many quadrivalents, while the hybrid between the wild tetraploid and the autotetraploid forms no quadrivalents but trivalents, bivalents and univalents. The wild tetraploid must therefore be an allo-tetraploid containing one set of 16 chromosomes which are homologous with the diploid set and another 16 which are not. The latter are probably derived from a species of *Cardamine*; this would account for the unisexual arrangement of the seeds of the wild tetraploid, contrasting with the bisexual arrangement in the diploid and autotetraploid.

70. PAL, B. P. and 635.657:581.162.5
 NARAYANA RAO, T.
Ovule mortality in gram (*Cicer arietinum* L.).
 Proc. Indian Acad. Sci. 1940 : 12 : Sect. B : 50-61.

The number of ovules per pod and the capacity of these ovules to develop into seeds varies with the variety. It was found that the two ovules nearest to the stigma develop more often into good seeds than those in the third and fourth positions. It is not possible to give a satisfactory explanation of the failure of ovules to develop into good seeds and it is suggested that the phenomenon is an expression of a type of self-incompatibility known as "reduced seed production".

Part II. Foreign.

STATISTICS 519

71. BRIEGER, F. G. 519.24
 Sobre o " χ^2 — test". (The χ^2 test).
 J. Agron., S. Paulo 1940 : 3 : 103-10.

The formula

$$\chi^2 = \frac{1}{2}(\delta - \sqrt{2n - 1})^2$$

gives a good approximation in all cases where n is not very different from the total of the degrees of freedom. When this is not the case, however, the author proposes the use of the formula

$$\chi^2 = \frac{1}{2}(\delta - \sqrt{2nf\chi^2})^2.$$

The results obtained by the two formulae are compared for a number of actual cases.

72. MENDONÇA, P. de Varennes e 519.24
 Das distribuições estatísticas mais usadas em provas de significação χ^2 de Pearson, t de Student, z de Fisher. (Statistical distributions most used in tests of significance—Pearson's χ^2 method, the t test of Student and Fisher's z test).
 Rev. Agron., Lisboa 1940 : 28 : 32-51.

The methods are described for the benefit of Portuguese readers.

BREEDING 575

73. PACHECO HERRARTE, M. 575:633
 La hibridación de plantas. (Plant hybridization).
 Rev. Agric. Guatemala 1940 : 17 : 237-41.

The author describes for the benefit of Spanish readers the advantages of hybridization and the methods of effecting it.

74. ÅKERMAN, Å. 575:633(48.5)
 Växtförädling och folkförsörjning. Föredrag vid Sveriges Utsädesförenings extra möte i Stockholm den 19/3 1940. (Plant breeding and national supplies—Lecture at the Swedish Seed Association's extraordinary meeting in Stockholm on 19/3/40).
 Sverig. Utsädesfören. Tidskr. 1940 : 50 : 57-65.

The need for Sweden to become self-supporting in the event of a blockade is pointed out and the role of plant breeding in augmenting her crop supply, and especially those plants yielding fats and proteins, is indicated. Recent advances in plant breeding technique (e.g. the use of colchicine and the induction of mutations) are recorded and the wheats Skandia II and 01035 and the oat Vg01534 and the new J153 barley (bred at the Jämtland Station by Sidens) are cited as instances of the progress made in yield improvement. The merits of legumes such as vetches, sweet lupins and the soya bean are discussed as highly promising material from which the plant breeder under present conditions might meet Swedish requirements of fat and protein for fodder and human consumption and other uses. The improvement of herbage plants and pastures is also considered.

75. TORSSELL, R. 575:633(48.5)
 Arbetsresultat och framtidsperspektiv vid Ultunafilialens verksamhet. Föredrag vid Sveriges Utsädesförenings årsmöte i Uppsala den 18 juli 1939. (Results and future prospects of the work of the Ultuna Branch—Lecture at the annual meeting of the Swedish Seed Association in Uppsala, 18th July, 1939).

Sverig. Utsädesfören. Tidskr. 1939 : 49 : 275-306.

The recent development and extension of the Ultuna Branch of the Swedish Seed Association has involved the provision of new buildings and equipment and facilities for utilizing results obtained at the Svalöf laboratories.

A new sub-station has been established at Latorp for the Örebro district.

The present report surveys recent advances in plant breeding at Ultuna:—

Autumn wheat.

Among the autumn wheats put on the market in 1936 were Thule III and Gluten, the ancestry of both of which is given. These wheats are characterized by good baking quality and winter-hardiness in combination with high hectolitre weight and in the case of Thule III, relatively late germination so that sprouting in the ear is less likely to occur. Gluten wheat also shows a great advance in stiffness of straw.

Another new strain 01250b (derived from Sol II x Svea II), still being tested, is specially interesting because of its very stiff straw and earliness—about three days earlier than the land wheat and five days earlier than Bore II. It also gives a high yield.

Among the late ripening types undergoing trials Bore II and Ergo (cf. "Plant Breeding Abstracts", Vol. IV, Abst. 941) are worthy of mention.

Spring wheat.

Though the improved strains gave 18-19% more grain than the land form at Ultuna for the period 1930-38, no outstanding forms were recorded. Diamant II however, in other localities surpassed Diamant I [Diamond I] and was also notable for improved strength of straw and baking quality.

Winter rye.

In comparative trials for 1933-38 the highest relative grain yield was 123 for Stål [Steel] rye which was also best in strength of straw in which respect Förädlad Wasaråg II [Improved Wasa rye II] came second.

Some Finnish varieties and one Estonian, named Sangaster, were also tested: they proved highly winter-hardy but could not compete with the best Swedish varieties in yield, straw strength or quality.

Oats.

In trials on different types of soil Seger [Victory] ranked first in yield but was surpassed in earliness and strength of straw by Stjärn [Star] and Guld regn II [Golden Rain II].

Among the black oats Klock III, Engelbrekt II and Stormogul II [Great Mogul II]—all derived from Klock II x Stormogul I—are worthy of note. Though at Ultuna Engelbrekt II did not surpass Klock III, it was superior in strength of straw. Stormogul II gave the higher grain yield of all varieties tested at Ultuna—6% more than Stormogul I—and also the strength of straw and grain quality are somewhat higher than in the latter variety which, however, still remains the better in yield of straw.

Weibull's Argus oat and the Svalöf varieties Extra Klock and Sirius represent a considerable advance in quality, the last two being fully equal to white oats in this respect. None of the three, however, have the true black oat characteristics and are more like Probsteir than Klock oats in tillering and time of shooting.

Barley.

The superiority of Kenia and Maja barley (cf. "Plant Breeding Abstracts", Vol. IV, Abst. 991) in comparative trials is recorded as well as the performance of hybrid derivatives from *nutans* and *erectum* crosses such as Primus II and its sibs, U31/109 and U31/59, all three being noted for their large grains. Varieties that have done well as regards earliness are Vega, Stella and Asplunds barley and the J131 K strain produced by co-operation between the Jämtland and Ultuna stations which is of great promise in the early class.

The varieties Puke II (cf. "Plant Breeding Abstracts", Vol. VII, Abst. 201) and Drake (cf. "Plant Breeding Abstracts", Vol. IV, Abst. 990) have also been included in trials.

Peas.

Yield trials are in progress with the early varieties Torsdags II [Thursday II] and Ambrosia II and with the medium earlies Gyllen [Golden] and Munk [Monk] since 1926; the last two have considerably outyielded the land varieties.

Quality is being tested by extensive cooking tests on which a report will be published. Meanwhile Gyllen, Ambrosia II and the Östgöta land variety have proved easier to cook than Torsdags II or Munk; the short variety Concordia had better cooking quality than Adoptiv. The chemical, physiological or anatomical characteristics affecting quality are being investigated.

Among the fodder peas the variety Hero, bred at the Västgöta station by selection from a Västgöta pea from Hyringa, has yielded on the average about 15% more than Solo. It has smaller seeds than Solo and ripens about 1 or 2 days later.

Some trials of grey varieties are in progress.

At Ultuna improved varieties and local strains of peas and beans, suitable for other regions have also been included in the trials. Such are: the fodder peas Jämtlandsärt (strain from Ås), Bottniaärt B, Hälsingeärt (Kilafors) and the local form from Rättvik (Born) as well as the following:—line Vrm 01020 selected at the Värmland Station from the last-mentioned, and the early large seeded Gröpärt [Grey Pea]. The fodder peas being tested at Ultuna include the very early yellow pea L0124, a selection from Hans Tedin's cross 0158 x 0156 of yellow peas. Yields in mixtures and varietal differences in pest resistance are also being investigated.

Taking the Östgöta yellow pea as representative of the unimproved type, the new yellow peas can be reckoned as giving a 10% higher yield, and the grey peas about 20%.

Some foreign varieties (populations) of vetches are being tested primarily for their value as breeding material.

Potato variety trials are also in progress.

Work on root crops has been concentrated on breeding better types and testing new strains and selections.

The results of flax variety trials are to be published with others on experimental technique. A summary of present aims in breeding the various cereal and other crops at the Ultuna Station is appended with observations on available plant material and the crosses made up to the present. The problems pertaining to legumes (including peas and vetches) are receiving special attention.

575:633(54)

The Institute of Plant Industry, Indore (India).

Chronica Botanica 1940 : 6 : 16-17.

This is a very brief account of the Institute of Plant Industry, Indore. A summary is given of the genetical, cytological and breeding work which is being carried out with cotton at the Institute.

77.

575:633(92)

Verslag over het jaar 1937 van Het Algemeen Landbouw Syndicaat—Het Zuid- en West-Sumatra Syndicaat—De Centrale Vereeniging tot beheer van Proefstations voor de Overjarige Cultures in Nederlandsch-Indië en van de onder deze Organisaties ressorteerende Vereenigingen en Instellingen. (Report for the year 1937 of The General Agriculture Syndicate—The South and West Sumatra Syndicate—The Central Association for the Management of Experiment Stations for Perennial Crops in the Netherlands Indies and of the Associations and Institutes under the jurisdiction of these Organizations).

Batavia 1938 : Pp. 218.

Rubber.

West Java Experiment Station.

Buitenzorg and South and West Sumatra Division.

The following conclusions (with certain reservations) were drawn as regards the mutual influence of stock and scion.

The thickest stocks gave the relatively thickest buddings; the stocks with the highest output gave the relatively most productive buddings; the thickest stocks gave the buddings that were relatively the highest yielding buddings. It seems probable that the budding has a favourable effect upon the productivity of the stock.

Twin plants (and stumps and marcots from them) exhibited practically similar growth in thickness and production, when growing under approximately the same conditions. Whether this would hold for twin plants under unlike conditions is uncertain—though twins growing under different conditions can be said to behave relatively similarly so that good growers and producers remain comparatively good.

Cramer's testatex knife successfully employed in nursery selection might, when seed was cheap, also be used in selecting suitable plants for stocks from among vigorous seedlings. With high grade "legitimate" seed, however, the use of the knife might not be worth while. The merit of tested legitimate seed is evident from the yields from various families raised from Tjir crosses, BD crosses and PR crosses. These families are also being studied for resistance to wind damage, brown bast, etc.

At Tjiomas seed was obtained by artificial pollination from 30 new families for a study of the progeny; about 50,000 pollinations were made and a set of about 6% was obtained. Certain estates too adopted artificial pollination in raising legitimate families. Some families from certain mother clones appear to yield very well, regardless of what paternal clone was used, and this possibly explains the good results often obtained with illegitimate seed, which should not, however, be used without thorough testing.

The selection programme has been considerably hastened by the provision of a large plantation for trials on the Tjitajam Estate where 1094 clones are being tested with PR107 as control. Increasing attention is being paid in clone selection to features such as susceptibility to wind damage and to fungous diseases of the tapping surface, quality of bast renewal and crown formation.

The output of the various clones is regularly recorded in the journal "Bergcultures" which is reviewed in "Plant Breeding Abstracts".

Clonal differences in susceptibility to bast disease exist and the Bodjong-Datar clones appear very susceptible.

Central and East Java Experiment Station.

The mutual influence of scion and stock is under investigation.

The collection of seed necessary for use in confirming the identity of various clones is being extended and the descriptions of clones in the young stage have been completed as far as possible.

A second seed nursery has been laid down containing alternating rows of Tjirandji 1, XV, AV157 and Pilmoor A44 and another seed garden for the clones Tjir 1 and XVI, LCB1320, Pilmoor A44, B84 and PR7 is being prepared.

Yield figures for the clone Gondang Tapen I in 1936 have been recorded.

Some new test plantations of various clones, seedlings and buddings have been laid down in different localities—an important branch of work which may become even more so in future, as rubber improvement advances and varieties more sensitive to local conditions may be involved.

Density of planting, thinning and tapping methods were also studied.

Besoeki Experiment Station.

At Kaliwining 129 new clones (mainly second and third generation) and 120 seedling families of *Hevea* were planted for testing with 168 different plantings of coffee between the rows.

The experiment at Klatakan indicated as before that buddings on their own stock give a higher yield than on seedlings raised from vigorous growing trees. Investigations on the fusion of the latex vessels of scion and stock and enzyme interaction between stock and graft have been made. Apparently the influence of the stock becomes greater, the further the tapping incision is from the site of fusion. Certain clonal combinations will stand tapping down to the stock, while others show a decreased yield even at 30 cm. above the place of fusion. Brown bast disease is closely connected with suitability of the stock.

The wood of Tjirandji I from Kaliwining has been found to be heavier than that from Deli; this may explain the less frequent occurrence of wind damage in East Java. The slow growth of a clone due to drought is held to result in heavier wood, but retardation due to other causes may produce lighter wood.

In research on buddings and seedlings some new highly promising East Java clones, such as PR.2 and LMOD.53, and seedlings of PR.1, LMOD.86, PR.2, PR.2 x LMOD.55, PR.7 x LMOD.86, Tjir 1 x 16 and AV.36 have been discovered. Many families gave yields equal to or better than those of the best clones now in tap in East Java.

At Kaliwining the clones Tjir 1, Pilmoor B.84 and Soengei Reko 9 appear worthy of note, judging by one tapping year.

Tjir 1 and BD.10 seemed specially susceptible to wind damage, whereas Tjir XV, BD.5, Pilmoor B.84, War.1 and AV.256 were resistant.

Density of planting is being studied with mixed collections of clones.

Tea.

West Java Experiment Station.

Buitenzorg and South and West Sumatra Division.

The diagnostic value of the inflorescence and of the number of anthers, petals, etc. in distinguishing clones was ascertained (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 920).

Studies are in progress on (1) the possible existence of a correlation between the periodicity observed in bud and leaf stages and the weather; and (2) the effects upon shoot development of plucking the terminal bud, the resting bud and the pecco bud.

Experiments indicate that scion and stock exert a mutual influence on each other--the vigour of the stock exhibiting a marked effect on the clone used as the scion; yield capacity is similarly influenced by the relation between stock and scion.

Attempts to hasten the supply of planting material by grafting young shoots have hitherto given uncertain results.

Nursery selection has not invariably proved more advantageous as regards yield than planting with unselected material and a comparison of the results from buddings with those from nursery selection suggested that vegetative selection may, in the future, come to be regarded as more promising than nursery selection. The latter method of course has its advantages in selecting stocks, etc.

Studies of the combined effect of the application of thinning in densely planted nurseries with selection based on specific gravity and diameter of the seeds, showed that the best results are obtained by selective thinning and the use of large seed; specific gravity seemed to be of less importance.

The technique of artificial pollination of tea has been worked out and apparently a set of 20% can be obtained; and though pollination with foreign pollen is not entirely excluded, for practical purposes the method is of value.

Various plantations for selected seed production are now ready for trials to be carried out.

Several plantations for seed production for buddings from a limited number of clones have been laid down.

Quality studies by Van Roggen of the type collection at Tjinjiroean have revealed considerable differences between the various types (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 590). Mother plant selection is being continued and at the same time the technique of selection is being investigated. A general survey of all mother tree selection experiments has been prepared (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 816). Out of about a million plants about 2100 have apparently been selected.

Initial tests indicate that clones appear markedly superior to seedlings in yield. Further tests are being begun, new selected nurseries having been laid out for this purpose.

In co-operation with Dr Deijs a beginning has been made with systematic quality determinations of the clones for testing. The method of preparation of small samples of leaf presented no difficulties, though there were some differences in the decisions of the testers. It was, however, very easy to detect differences in quality.

Tea prepared from Goenoeng Paok clones has already acquired a special place on the market--which confirms the former quality determinations from small samples of this clone prepared by hand.

Experiments again indicated that higher yields accompany rather denser plantings.

Research on tea preparation has been actively pursued from various aspects. The micro-preparation method appears to be a considerable assistance in selection work and samples from a large number of clones have been prepared and sent to the Tea Experiment Bureau for judging.

Central and East Java Experiment Station.

In work on the floral biology of tea, selfed seed capable of germination was obtained with isolated tea plants in the Central Java experiments.

Field tests comprised trials of clones, of clones with seedlings and of seedlings alone.

Cinchona.

West Java Experiment Station.

Tjinjiroean Division.

A study was made of the periodic variations in the quantities of the various alkaloids in the bark of a cinchona tree. The clone Kertamanah 63, which differs from other Ledgeriana clones in exhibiting definite variation in the amounts of quinine and cinchonidine in the bark, proved specially suited for this investigation. The correlation between the two substances was a negative one which increased when the samples taken were limited to the immediate vicinity of the site of fusion of the graft on the succirubra stock.

Observations were carried out on pollination and heterostyly. Self-pollination of the clones Tjinjiroean 1, Djajasana, Tjibeureum 5 and KP.77 gave mature fruits only in the case of

KP.77, a clone which had been chosen in accordance with Ernst's view that self-pollination in cinchona is most successful in individuals in which the difference between the length of the stigma and anthers is least. The potential use of clone KP.77 as initial material from which to attempt to breed even more markedly self-fertile plants is suggested.

The collection of yield data from Ledgeriana clones was continued. From about 80 selected mother trees grafting material has been planted out to test the clones Tjinjiroean 1, Kertamanah 63, W.3 and 38n plants from bulked Rioeng Goenoeng and Tjiater seed and also clones from some bulked Tjiater mother trees of MT.22 among others are also being tested. Yield records are available for 8-year-old trees of the clones Tjinj.1, K.63, Tjib.5 and Tjib.14. The Ledgeriana clones showed wide differences (from 30% to 50%) in the amount of succirubra root bark produced. Since in general a lot of root bark indicates a large root system and little root bark a small root system, the clones Tjinj.1, W.3, Letter B, 38f, Poentjak Gedeh 7, K.290, Wanasaki 119 and Rioeng Goenoeng 1 may be said to have large root systems, and the clones K.35, K.63, K.236, K.241, Tjib.5 and Tjikapoendoeng 59 small ones. Theoretically, these findings would seem to suggest that with grafts of Ledgeriana on succirubra there must be very considerable growth correlations between scion and stock. Practically, it is important to discover whether a graft of a clone with a small root system requires less room than one from a clone with a large root system. General experience with K.63 suggests that such is the case. K.63 is known as one that can still form very massive stems when the dense type of planting is maintained - a fact which suggests further that the yield per hectare might be increased by using clones with small root systems and denser planting than usual.

Yield trials of the seedlings K.63, Tjinj.1, W.3, 38n and M.R.G. and Tjiater seedlings in plots showed that K.63 no longer surpassed the others, as it had done when planted in rows owing to its rapid growth which somewhat retarded the development of its competitors.

Observations are gradually being collected on the influence of density of planting on the yield relationships between various clones.

The ratio between quinine per tree and quinine per ring has been found in general to be higher for clones with a higher quinine content.

The transference of the Tjinjiroean Division to Buitenzorg was begun.

Coffee.

Central and East Java Experiment Station.

Further confirmation was obtained of the finding that the percentage set is primarily determined by the mother clone so that, except in the very rare instances of incompatibility, it should be unnecessary to pollinate each new clone with all known clones, especially as the general practice recommended to growers is to plant at least 5 clones in alternating rows. Preliminary experiments are in progress to estimate the amount of seed set from self-pollination by noting the frequency of certain genetically recessive abnormalities such as red leaf, that occur under conditions of cross-pollination with a normal (i.e. non-emasculated) clone.

At Malang and Soember Asin pollination tests with trees or collections of trees, isolated in bamboo cages completely closed with a sort of rafha, have resulted in some good hybrids.

The role of *Apis indica* in cross-pollination has been found to be relatively small where the area of trees in flower is large.

Cytological research included work on fixation and on the development of the embryo and its surrounding tissues under normal conditions. The tissues of the maturing coffee bean were found to be derived from the integument.

In a study of pollen germination on the style and of fertilization, some information has been collected mainly on the elaboration of a good method of demonstrating the presence of pollen tubes in the style and stigma.

Chromosome counts have confirmed: $n = 11$ for the Robusta clones tested, $n = 11$ and $2n = 22$ for *Coffea excelsa* and $2n = 22$ for *C. congensis*. For *C. arabica*, however, the diploid number proved to be 44 and for the new material of Kawisari B the haploid number found was 22 instead of 33 recorded by Mej. Gobée. It is possible that the hybrid Kawisari plants may include both types. In the Robusta clones lagging of chromosomes or chromosome fragments on the spindle were constantly found.

Preliminary attempts to identify the various chromosomes were made.

A study of embryonic development in relation to the occurrence of round beans and spongy beans has thrown some light on their pathological basis.

Counts were made of the extent of flowering at various places and of the fruit set of certain clones. The extent of pollen distribution was also studied.

Some conclusions were reached on the development of lateral scions.

Seed of the Robusta type received from Uganda comprised wild coffee from the Kasai forest and selection numbers 42 and 209.

The ten Kapakata coffee bushes gave on an average 3.5 kg. of berries and the set was about 30%.

Large numbers of new mother trees were selected, many from hybrid seedlings of known parentage and other material grown at Soember Asin.

Crosses were carried out with selections which have been found to increase the number of berries per cluster and per branch; some new combinations were made involving selections such as SA.172 and BP.42 which increase the size of the bean.

From other crosses it was hoped that clones such as TP.21, BP.42, SA.34 and SA.567 might ultimately be obtained suitable for the production of laterals when grafted.

Measurements of the stems of Robusta and other clones were taken to find a simple basis for comparing growth.

The possibilities of nursery selection were tested at Soember Asin with "illegitimate" plants from a number of mother trees selected for "legitimate" seedlings, the basis of selection in the first instance being vigour. Productivity and other desirable characters are the ultimate object in view.

The study of leaf, flower and berry characters is being pursued and material collected on the identification of coffee clones. Also descriptions of the main varieties and forms of coffee have been practically completed.

Some very good results were obtained in eelworm resistance trials in which different combinations of stocks and scions were used.

Work on uniformity trials was continued and a publication on the subject will probably be issued.

The field tests in progress include test plantations of "legitimate" hybrid seedlings, of plants from seed from more or less isolated monoclonal plantings and of buddings of various clones. Artificial pollination experiments showed a significant increase in the number of berries per cluster and a significant reduction in the number of round beans.

Attempts to promote pollination by beating the branches and other means did not appear to have any effect on the ultimate yield.

Methods of determining quality and various problems of quality improvement are being investigated.

Besoeki Experiment Station.

From artificial cross-pollinations evidence was obtained that, at least with vigorous young trees, rain at noon on the day of flowering had had only slight ill-effects on the set of fruit.

At Kaliwining 25 SA and Bgn hybrid families were planted out and 120 new coffee clones were included in the specimen collections.

New replicated test plot plantations have been laid out, with certain varieties (such as BP.39 or BP.42) and a plot containing grafts as a control.

Many new selections from mother trees from seedling families have shown promise and are to be compared as seedlings and as grafts with the well known BP, SA and Bgn varieties. BP.42 may be classed among the highest yielders under very varied conditions. BP.25, BP.39, SA.56 and SA.158 also proved good producers.

This year crosses were made between the newest selections.

The relation of density of planting to yield was studied.

Cacao.

Central and East Java Experiment Station.

In continuing research on the identification and description of cacao clones, the possible value of leaf characters as distinctive criteria is being examined. Some preliminary descriptions of DR clones have been drawn up, a difficulty here being that the amount of colouring matter in the flower buds and wall of the pericarp depends largely upon lighting conditions. As part of the observations on identification, leaf characters and corolla shape were studied in the mother trees, As.1-11 (MJ.302), As.12-25 and Getas 1-15, from which also small quantities of cacao were separately prepared. The results suggest that quality estimation should form part of the process of selection of mother trees.

Comparisons of mother trees of the Getasforastero, Assinan-angoleta and Djatiroenggo types have revealed the defects of the first two and indicate that the third is the one which should be used in breeding for improvement. It is now being more extensively grown for mother tree selection.

Observations on cotyledon colour of mother trees showed that cross-pollination by neighbouring trees is much more frequent than had been supposed and that in selection for cotyledon colour the seed must be examined pod by pod instead of making merely a rough estimate of the percentage of purple cotyledons.

A plantation of buddings of MJ.305 (Assinan-angoleta) was examined for the third time for pod shape and the results agreed well in very many cases with those obtained on the basis of number of leaf segments a character, therefore, of value in distinguishing clones. A further inspection showed that the shape of the corolla could be similarly used.

The clones in various plantations of seedlings (MJ.306, Assinan-angoleta) and buddings (MJ.320, Djatiroenggo) were examined for purity and various fruit, leaf and flower characters and in some instances cocoa samples were prepared. The numbers of fruits per tree were recorded for Getasforastero and the angoletara seedlings.

The new test plantation MJ.411 laid down with 16 families of DR mother trees is doing well. Dr Roelofsen has made a study of the olfactory method of judging aroma. Investigations on cocoa preparation are practically complete. The fermentation process has been extensively studied and an objective technique for judging the factory product has occupied attention. On the Getas, Assinan and Djati Roenggo estates data were collected on pod size and content and the quality of the manufactured product. The tannin content of the fresh bean appears to affect the quality of the market product and tannin determinations with fresh beans from various clones showed that the purple lobes contain more tannin than the white. Marked variation may occur in the tannin content in the white lobes in a particular fruit or in fruits of the same tree at the same time and still greater variations may be found in different mother trees of the same type. No significant differences could, however, be found between different types.

Wild tamarind.

Central and East Java Experiment Station.

Seedless wild tamarind is being more and more widely used for shade and is specially useful for districts with a very dry east monsoon period.

The seedless *Leucaena pulverulenta* and *L. glabrata* x *L. glauca* promise to be excellent shade trees. They grow considerably faster than the ordinary *L. glauca* — a point which may also prove useful as regards fuel production on estates. From the ordinary wild tamarind with few seeds, selections have been made considerably exceeding the common type in rapidity of growth.

78. KORMILITSYN, A. M. 575:633:551.566.1(47)
(**The Institute of the Arid Subtropics at the Pan-Union Exhibition.**)

Soviet Subtropics 1940 : No. 9 (72) : 19-23.

The Institute has tested the local fruit forms and recommendations are given as to the best varieties of pomegranate, fig, sweet almond, walnut, pistachio and persimmon; olive, citrus fruits, geranium, sugar cane, tung and various medicinal plants have also received attention.

79. HANSEN, N. E. 575:634(78.3)
634:575.127

New hardy fruits for the Northwest.

Bull. S. Dak. Agric. Exp. Sta. 1940 : No. 339 : Pp. 31.

This bulletin is a record of the new hardy fruits introduced by the South Dakota Experiment Station from 1927 to 1940. The names, dates of introduction, the main characteristics and the parentages of the new varieties are given. Accounts are also given of the breeding work in progress.

Five new hardy domestic apples (*Pyrus Malus*) and very many crab apples (both from selfing of crabs and from crosses between crabs and domestics) have been introduced. Many of the hybrids have large fruits and are very heavy yielders. Apples with red flowers and red flesh are being selected from crosses between the red-vein crab (*P. Malus Niedzwetzkyana*) and domestics. The problem of combining the hardiness of the Siberian crab (*P. baccata*) with the large fruit size of domestics is also being investigated. From crosses between an American

wild crab (*P. Ioensis*) and Jonathan, two varieties, the Watopa and the Nebo, both of which have largish fruits and are early bearers, have been obtained. *P. Ioensis* has also been crossed with *P. baccata* to obtain a tree named the Amsib which is an early bearer and very productive. By multiple crosses between *P. Ioensis*, *P. baccata* and domestics, it is hoped to obtain varieties which have long winter-keeping quality, a high degree of winter-hardiness and large, good quality fruits (these three characters being possessed by the three parent species singly). Varieties obtained from such crosses have the group name Trio crab apples. Hybrid seedlings, some of which have borne heavy crops of fruit, excellent in quality and of good commercial size, have been obtained from crosses between the native pear of East Siberia and North China and the standard cultivated pears. Such trees have remained free from fire-blight (*Bacillus amylovorus*).

The Oacoma, a variety of the indigenous plum (*Prunus Americana*) is hardy, a very heavy bearer and should become widely grown. The northern strains of *P. Americana* have been found to be more hardy than southern strains. Hybrids between the native plum and the Japanese plum (*P. salicina* Lindl., *P. triflora* Roxbg) have tended to replace selected native plums because of their larger fruits. An extra large plum, the Tecumseh, was obtained from the cross Shiro x Surprise and has five species in its pedigree. Fragrant plums have been obtained from crosses of *P. Americana* with the Chinese apricot-plum (*P. Simonii*) and combine the hardy characteristics of the native plum with the flavour of the other parent. Selections have been and are being made with the Manitoba native plum (*P. nigra*), with the South Dakota native sandcherry (*P. Besseyi*) and with the Siberian dwarf cherry (*P. fruticosa*). A selected strain of the sandcherry is known as the Hansen Bush Cherry. Cherry-plums (hybrids of the Hansen Bush Cherry with other species) are now widely grown.

Lastly there are described several varieties of the Golden Currant (*Ribes odoratum*) which have been selected from fruits obtained from wild plants.

GENETICS 575.1

80.		575.1
	CATCHESIDE, D. G.	576.3
	Gene and chromosome theory and cytology at the Seventh International Genetical Congress, Edinburgh, 1939.	
	Chronica Botanica 1940 : 6 : 9-11.	
	A very brief summary of the many papers on gene and chromosome theory and cytology given at the Seventh International Genetical Congress.	
81.	ANDERSON, E. and OWNBEY, R. P.	575.11:576.16:578.08
	The genetic coefficients of specific difference.	
	Ann. Mo. Bot. Gdn 1939 : 26 : 325-46.	
	From the studies of closely related species it has been concluded that species differences should be sought, not in any particular character, but in harmonically integrated tendencies (genetic coefficients) expressed more or less throughout the whole organism. A simple mathematical formula for the measurement of specific differences is elaborated and exemplified by the determination of 11 genetic coefficients differentiating <i>Nicotiana alata</i> from <i>N. Langsdorffii</i> . The most important of these coefficients are those affecting cell size, plastic development and the auxin mechanism.	
	The technique could be used in the genetic analysis of differences between species, in studies of phylogenetic patterns and other biological problems.	
82.	LAMPRECHT, H.	575.115.061.6:581.48:635.652
	Lokale Umwandlung von Rezessivität in Dominanz durch die Wirkung eines besonderen Gens bei <i>Phaseolus vulgaris</i> . (Local transformation of recessivity into dominance by the action of a particular gene in <i>P. vulgaris</i>).	
	Z. indukt. Abstamm.- u. VererbLehre 1939 : 77 : 186-94.	
	The behaviour of the recessive gene <i>mar</i> , which causes a broad coloured area outside the hilum, is studied in relation to other genotypical constitutions for seed coat colour. Conditions for the effective working of <i>mar</i> besides recessiveness, are recessiveness in the gene for colour, <i>j</i> , and the presence of a dominant colour gene <i>G</i> or <i>B</i> .	

Two possibilities are suggested; either recessiveness in *mar* causes, in the margin round the hilum, a localized alteration of *j* to the dominant form *J*, or the co-operation between *mar* and *j* in the course of development brings about the same result with regard to the colour of the margin but without the change of *j* to *J*.

The author considers the latter theory to be the more probable.

R. M. I.

83. JOHNSON, N. L. 575.116.1:519.24

Parabolic test for linkage.

Ann. Math. Statist. 1940 : 11 : 227-53.

This paper is concerned with the problem of testing the independence of the two classifications in a 2 x 2 table. The detection of linkage in genetical data usually depends on a test of this kind. The author uses the Neyman-Pearson approach and endeavours to find a test which will minimize both first and second kind errors, that is, those of rejecting the hypothesis when it is true and of accepting it when it is false. No single test can be found to cover all contingencies and two are eventually given, one which is applicable when both gene ratios are $\frac{1}{2}$, and one which is suitable for all other cases. These tests are then compared with the more commonly used χ^2 test and it is claimed that in general the new parabolic test is slightly superior to χ^2 , though for some kinds of deviation χ^2 has the advantage. The two tests give, however, almost identical results. The parabolic test is the more cumbersome to compute and also is apparently at a disadvantage compared with χ^2 in not being additive. K. M.

84. AZEVEDO, J. P. de 575.125

A heterosis e o melhoramento. (Heterosis and breeding).

Rev. Agron., Lisboa 1939 : 27 : 231-34.

The author expresses the view that heterosis is the result of the combination of dominant genes affecting vigour, that segregates from plants showing heterosis should contain individuals more vigorous than the hybrid and that F_1 plants showing heterosis are for this reason more likely to give vigorous progeny than hybrids not showing heterosis. Experiments are being designed to test the hypothesis.

85. STEIN, E. 575.172:581.165.71:635.64

Über einige Propfversuche mit erblichen, durch Radium Bestrahlung erzeugten Varianten von *Antirrhinum majus*, *Antirrhinum siculum* und *Solanum lycopersicum* (Tomate König Humbert). I. [On some grafting experiments with heritable variants of *A. majus*, *A. siculum* and *S. lycopersicum* (König Humbert tomato) induced by irradiation with radium. I].

Biol. Zbl. 1939 : 59 : 59-78.

A record of some preliminary results of grafting experiments bearing on the physiology of gene action. No detailed interpretation of the phenomena is offered at the present stage of the investigation.

Grafts of two degenerate mutant types of *A. majus* obtained by radium irradiations of embryos were made on their respective normal non-mutant forms, but no mutual action between scion and stock has so far been observed.

The *nana* radium mutation of the King Humbert tomato is characterized by chlorophyll deficiency, dwarfing, lack of flowering capacity and absence of development of lateral shoots; but on grafting the mutant on a stock with its normal allelomorph the characters in question no longer behave as an aggregate; chlorophyll deficiency is unaffected, but height becomes normal and normal development of inflorescences and lateral branches takes place. Green leaves left on the stock inhibit the development of the shoots of the *nana* scion. The nutritive effect from the stock resulting in the attainment of normal height is therefore determined by the root. The possibility of some additional action of growth substance derived from the normal allelomorph is discussed. Grafts of the mutant *sterilis* of *Antirrhinum siculum* on the normal stock also provided evidence of a similar disintegration of two characters which have been regarded as constituting a single mutation.

Two possible interpretations of the interaction between scion and stock are mentioned with special reference to the existence of an organ forming substance postulated by the authoress as determining reproduction and passing in the *siculum* instance from the normal stock to the abnormal scion shoot.

86. DANIEL, L. 575.31:635.24
 L'hérédité chez les descendants du topinambour greffé (Analogie avec la vigne greffée). [Inheritance in the descendants of the grafted artichoke (Analogy with the grafted vine)].
 Progr. Agric. Vitic. 1940 : 113 : 90-92.

Further observations (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1111) on the inheritance of acquired characters in the graft of Jerusalem artichoke upon the sunflower are presented with similar speculations on degeneration effects and changes in disease resistance in various plants including the vine.

ORIGIN OF SPECIES, ETC. 576.1

87. KRUG, C. A. 576.12:575.1
 Genética e evolução (Genetics and evolution). 633:576.16
 Rev. Agric., S. Paulo 1940 : 15 : 271-88.

After a review of the early work on evolution the author discusses the role of mutations, chromosome aberrations, hybridization and natural selection. There follows a discussion of the origin of the main crop plants of Brazil. Cytological studies of a triploid *Coffea* hybrid, *C. arabica* ($2n = 44$) x *C. canephora* ($2n = 22$) have shown the presence of trivalents and suggest that *C. arabica* is an allopolyploid. Spontaneous mutations have been observed frequently and some have proved superior in certain respects to the normal, e.g. the variety *semperflorens* which suffers less reduction in yield from the effects of drought. Many of the mutants are dominant to the normal type. Regarding the origin of *Gossypium* the views of Harland (cf. "Plant Breeding Abstracts", Vol. IX, p. 488) are cited and for *Zea* the views of both Mangelsdorf (cf. "Plant Breeding Abstracts", Vol. X, Abst. 760) and Beadle (cf. "Plant Breeding Abstracts", Vol. X, Abst. 136) are mentioned.

88. VASCONCELLOS, J. de Carvalho e 576.16
 O conceito de espécie e das suas subdivisões. (The concept of the species and of its subdivisions).
 Rev. Agron., Lisboa 1939 : 27 : 214-30.

The concept of the species and its subdivisions of pure lines, clones, cultivated varieties, forms and castes are discussed and defined.

CYTOTOLOGY 576.3

89. VILLARS, R. 576.356:581.04
 Etude cytologique de l'action des rayons X sur les racines colchicinées. (Cytological study of the action of X-rays on roots treated with colchicine).

C.R. Soc. Biol., Paris 1940 : 133 : 424-26.
 A study of the effects of X-rays on the meristematic cells of roots of *Pisum sativum* and *Allium Cepa* treated with colchicine showed that the X-rays produce no apparent change in the prophase chromosomes while they induce rapid changes in chromosomes no longer surrounded by the nuclear membrane.

90. SCHWANITZ, F. 576.356.5:575:633
 Polyploidie und Pflanzenzüchtung. (Polyploidy and plant breeding).
 Naturwissenschaften 1940 : 28 : 353-61.

A review of the occurrence of polyploidy, its effects on the plant and the various applications of the changes it causes from the point of view of plant breeding. R. M. I.

91. KOSTOFF, D. 576.356.5:576.356:581.04:633
 Atypical growth, abnormal mitosis and polyploidy induced by ethyl-mercury-chloride.
 Phytopath. Z. 1940 : 13 : 91-96.

The treatment of germinating grains and seeds of wheat, rye, *Pisum sativum*, *Linum usitatissimum* and *Crepis capillaris* with dilute solutions of the fungicide Granosan, which contains 2% of ethyl mercury chloride, showed that abnormal mitosis was induced in *Pisum*, rye and wheat and is associated with atypical growth. Mitosis in *Linum* and *Crepis* is not noticeably affected. The use of Granosan as a fungicide is not recommended for wheat, rye or *Pisum*. R. M. I.

92. STRAUB, J. 576.356.5:581.036
 Polyploidieauslösung durch Temperaturwirkungen. (Entwicklungs-physiologische Untersuchungen an der reproductiven Phase von *Gasteria*). [Induction of polyploidy by temperature effects (Investigations on physiological development in the reproductive phase of *Gasteria*)]. Z. Bot. 1939 : 34 : 385-481.
 Temperatures over +35° and under +10° were found to cause variations in the course of meiosis in both pollen mother cells and egg mother cells of flower buds of *Gasteria*. Changes from high to low temperatures and vice versa were found to give a higher percentage of polyploid cells.
 By the pollination of normal egg cells with diploid pollen, only a few polyploids resulted. Egg cells with increased chromosome numbers pollinated with normal pollen produced, on the other hand, triploids and other polyploids. R. M. I.

93. LEFÈVRE, J. 576.356.5:581.04:633
 Actions similaires sur les mitoses végétales de l'anéthol et des substances du groupe de la colchicine. (Similar actions of anethole and of the substances of the colchicine group). C.R. Soc. Biol., Paris 1940 : 133 : 616-18.
 The effects produced by anethole treatment of wheat, peas, beans and radishes resemble those obtained with colchicine or phenylurethane.
 The author is sceptical of the possibility of obtaining stable polyploid forms by the use of such substances.

94. SIMONET, M. 576.356.5:581.04:633.16
 Anomalies de la caryokinèse végétale des types colchicinique et paradichlorobenzénique, produites par un dérivé nitré des carbures cycliques : le M. nitroxylène-1-3-5. (Anomalies of plant karyokinesis of the colchicine and paradichlorobenzene types produced by a nitro derivative of the cyclic hydrocarbons, m-nitroxylene-1-3-5). C.R. Soc. Biol., Paris 1940 : 133 : 561-63.
 A note on the morphological and karyological effects in barley and flax of the action of m-nitroxylene-1-3-5 upon the seeds. Though the intermediate effects differed in the two plant forms, in both cases they culminated in the production of polyploid cells.

95. WERNER, G. 576.356.5:581.04:633.52
 576.356.5:581.04:635.656
 Zytologische Untersuchungen über die Wirkung des Colchicins bei zwei verschiedenen reagierenden Pflanzen : Lein und Erbse. (Cytological investigations on the action of colchicine in two plants reacting differently : flax and pea). Biol. Zbl. 1940 : 60 : 86-103.
 Polyploid cells were readily induced in the dividing cells of germinating seeds of flax and peas by the use of colchicine. The possibility is noted of obtaining polyploid plants by inducing polyploidy in the initial cells of the growing point. R. M. I.

96. FLOVIK, K. 576.356.5:581.9:576.16
 Chromosome numbers and polyploidy within the flora of Spitzbergen. Hereditas, Lund 1940 : 26 : 430-40.
 The chromosome numbers of 68 species and varieties of higher plants from Spitzbergen were determined. About 80% of the plants were found to be polyploids, thus supporting the hypothesis that polyploidy increases the adaptability to extreme habitats. Several intra-specific chromosome races were found and usually the race with the higher chromosome number had the most northern distribution. In two species, however, the diploid forms occur in Spitzbergen, while the more southern forms are polyploid.

97. BOWDEN, W. M. 576.356.5:632.111
 Diploidy, polyploidy and winter hardiness relationships in the flowering plants. Amer. J. Bot. 1940 : 27 : 357-71.
 For a wide range of species the chromosome number and approximate degree of winter-

hardiness are tabulated. In general no relation was found between winter-hardiness and chromosome number.

98. LEVAN, A. 576.356.5:633:575:581.04
 En ny tillämpning av kemien inom växtförädlingen. (A new application
 of chemistry in plant breeding).

Sverig. Utsädesfören. Tidskr. 1940 : 50 : 66-76.

In addition to its use in determining the quality of strains and varieties of crop plants chemical research has led to advances in plant breeding by providing a mechanism whereby polyploid forms can be produced. The well known cytological effects of colchicine and acenaphthene and their possible chemical basis are examined and a list of plant families and genera in which various authors have investigated such reactions is given, with a record of unpublished work by Swedish workers on the production of tetraploid sugar beets, soya beans, red clover, flax and potatoes, following colchicine treatment. Records of amphidiploids similarly obtained from species crosses are also tabulated.

In addition to the work of Russian and French investigators on the effects of certain halogen derivatives of naphthalene, research in progress in Sweden so far shows that the activity of the substances tested differs according to the position of the halogen atom in the molecule, the α positions in the mono-halogen compounds constituting active forms, and the β positions inactive ones—only in *Papaver* did a β form prove active.

Furthermore, in contrast to the conditions as regards colchicine, certain crop plants showed marked immunity and though few data are yet available, it appears that a certain agreement is to be found between systematic relationship and the reaction to various substances. *Triticum*, *Secale*, *Hordeum* and *Phleum* give a typical "colchicine" effect after treatment with α -chloronaphthalene, β -bromo-naphthalene, 1,2-dichloro-naphthalene and 1,2-dibromo-naphthalene. *Hordeum* gives a positive effect also on treatment with pure naphthalene, thus showing the halogen atom is not essential. *Beta*, *Papaver* and *Petunia* also reacted. The Leguminosae appear to be entirely immune to all these substances, judging from experiments with *Vicia* (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1465), *Soya* and *Trifolium*. *Allium*, *Cannabis*, *Linum* and *Sinapis* also showed no effects.

Among other substances tested apiol produced effects identical with those obtained with colchicine used on *Hordeum*, *Triticum* and *Cucurbita*. (Cf. "Plant Breeding Abstracts", Vol. X, Abst. 353). All substances producing the "colchicine" effect have in common a benzene ring.

The immunity in certain plant forms to a number of the substances tested suggests that the reaction sequence started by the treatment and terminating in the inhibition of the spindle mechanism proceeds differently in different plants. Possibly some plants can elaborate a kind of anti-toxin which inactivates certain substances. For *Colchicum* and *Petroselinum* (which produces apiol) such immunity was an essential condition of the survival of the species. How complicated the basis of this immunity may be is evident from the fact that the autumn crocus, which is completely immune to colchicine, is very readily affected by acenaphthene (cf. Abst. 217).

PLANT DISEASES AND PESTS 632

99. CHRISTENSEN, J. J. and RODENHISER, H. A. 632.451.2:575
 Physiologic specialization and genetics of the smut fungi.
 Bot. Rev. 1940 : 6 : 389-425.

A general review, covering such topics as physiological races, breeding resistant cereals, nuclear cycle, sex inheritance, hybridization and mutation. The bibliography contains 132 references.

100. ZACK, G. A. 632.451.3:633.11:581.01
 (On the fundamentals of phytopathological characteristics of varieties and on the significance of artificial inoculation in selection).
 Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1940 : No. 6 : 12-14.

Artificial infection with smut (*Tilletia tritici*) during successive generations caused a reduction in susceptibility in some varieties but in others an increase. The behaviour of the varieties was fairly constant and seems to be a hereditary varietal characteristic.

101. FLOR, H. H. 632.452:576.16:633.854.54-1.521.6
New physiologic races of flax rust.
 J. Agric. Res. 1940 : 60 : 575-91.

Ten new physiological races of flax rust (*Melampsora lini*), in addition to the fourteen previously reported (cf. "Plant Breeding Abstracts", Vol. VI, Abst. 805), have been identified, using eleven varieties of flax. All 201 varieties and strains of flax tested, including the varieties Argentine, Bombay and Ottawa 770B, which had been previously reported as immune, were susceptible to at least one race of the rust. It might, however, be possible by crossing Bombay or J.W.S. with either Ottawa 770B or Newland to develop a race of flax immune to all known races of rust. On the other hand it is possible that new races of rust are produced each spring by hybridization, as in temperate regions the rust overwinters in the telial stage.

102. COUTINHO, L. de Azevedo 632.8:576.356:575.17
 Os virus como agentes modificadores dos cromosomas. (**Viruses as agents modifying the chromosomes.**)
 Rev. Agron., Lisboa 1940 : 28 : 83-100.

Plants of *Vicia Faba* L. were infected with bean mosaic virus. The chromosomes of the resulting plants were compared with those of normal plants at somatic metaphase and anaphase and showed a distinctly higher proportion of fragmentations, deficiencies, translocations, and lateral unions of chromosomes. It is pointed out that virus attack is more vigorous in dividing cells, which incidentally is the time at which the genes are being most actively reproduced. The similarity in behaviour between the virus and the gene suggests that their simultaneous presence in the dividing cells creates a competition for initial materials and that this may be the cause of the abnormal chromosome development which leads to the deficiencies and ruptures here observed.

103. SIEVERS, A. F., 632.951.1-1.557:581.165.1
 LOWMAN, M. S.,
 RUSSELL, G. A. and
 SULLIVAN, W. N.
Changes in the insecticidal value of the roots of cultivated Devil's Shoestring, *Tephrosia virginiana*, at four seasonal growth periods.
 Amer. J. Bot. 1940 : 27 : 284-88.

The chloroform extractive, the rotenone content and the toxicity to house flies of roots of clonal progenies of *T. virginiana* were studied. The toxicity of the roots of the several clonal progenies of the same parent does not vary but significant differences were found in toxicity between the progenies of different parents.

ECONOMIC PLANTS 633

104. STOUT, A. B. 633:001.4:576.16
The nomenclature of cultivated plants.
 Amer. J. Bot. 1940 : 27 : 339-47.

The application of the terms species, varieties, cultivars and clones to cultivated plants is discussed. The international rules of nomenclature—the de Candolle "laws" of 1867, the Vienna rules of 1905, the International Rules for Botanical nomenclature as revised in 1930, and rules suggested by International Horticultural Congresses (particularly that of 1930)—are summarized in so far as they concern the naming of species and varieties. It is also pointed out that the word "variety" is very indefinitely used and the importance of the recognition of the status of clones and apomicts is stressed.

WHEAT 633.11

105. MIDDLETON, G. K., 633.11:575(75.6)
 CHAPMAN, W. H.,
 HENDRICKS, J. W. and
 COLVARD, D. W.
Wheat varieties for North Carolina.

Bull. N.C. Agric. Exp. Sta. 1940 : No. 328 : Pp. 11.

Descriptions are given of the following wheat varieties which are suitable for North Carolina—Purplestraw, Carala, Redhart, Leap, Fulcaster, Forward and Greeson. Carala, a selection

from Alabama Blue Stem which was originally called Alabama Blue Stem 89, is an early stiff-strawed selection which has given very high average yields.

106. QUISENBERRY, K. S.,
WEBSTER, O. J. and
KIESSELBACH, T. A.

633.11:575(78.2)

Varieties of winter wheat in Nebraska.

Bull. Neb. Agric. Exp. Sta. 1940 : No. 326 : Pp. 28.

Brief mention is made in this bulletin of the winter wheat improvement work at the Nebraska Experiment Station. A major objective is the breeding of a winter wheat resistant to stem rust by hybridizing winter wheats with the spring wheat Hope. The major part of the bulletin consists of the results of variety trials and the description of important varieties. There are also notes on milling and baking tests, winter-hardiness and smut resistance.

107. BERG, S. O. 633.11:575:664.641.016(48.5)
Arbetet vid Weibullsholm för höjandet av höstvetets baktionskvalitet.
(Work at Weibullsholm to improve the baking quality of winter wheat).

K. LantbrAkad. Tidskr. 1940 : 79 : 97-123.

Having surveyed the development of wheat production in Sweden and the gradual improvement of its quality, the author reviews the progress in wheat breeding with special reference to quality up to the present year. Incidentally the difficulty and significance are discussed of the problem of combining high yield of grain and high content of crude protein, two features apparently negatively correlated under the conditions of the variety trials which provided the author with the statistical data for his deduction.

The origin of the famous wheat Bánkuter 178 with its high protein content and grain quality and its disease resistance is outlined and its performance in various trials from 1927-39 is discussed in detail.

The results of the series of crosses begun in 1928 between Bánkuter 178 and high yielding Swedish types such as Standard, Saxo, Ankar, Ankar II and its related form No. 3922 with the object of combining high quality, yield, winter-hardiness and strength of straw are described, with special reference to the lines 5132, 5133, 5160, 5166 and 5167 which were among the best obtained. By line selection among back-crosses made in 1930 with these strains 43 new varieties were available by 1935 for inclusion in yield and quality tests from 1935-1939. The best of these varieties were 6470—from 5133 derived from (Bánkuter 178 x Standard) x Äring; 6540—from 5160 derived from (Bánkuter 178 x 3922) x Äring; 6590—from 5166 derived from (Bánkuter 178 x 3922) x Äring; and 6619—from 5167 also derived from (Bánkuter 178 x 3922) x Äring.

Repeated selection of the variety 6470 has resulted in 2 lines, one apparently having a relatively high grain yield, and the other with improved baking quality. The tests are, however, still in progress. Tests of 6542, 6590 and 6619 respectively with Standard and of Äring with Standard and Skandia with the same variety provided the author with data for a comparison of the performance of all these wheats and also of Bánkuter 178. Apparently none of the 3 new varieties equals their maternal grandparent in quality; the superiority of Bánkuter 178 to Standard in baking quality may be due to some extent to its higher crude protein content and to a large extent to its superior gluten quality. The transmission of this character in a greater or lesser degree certainly explains the relatively good baking quality of 6542, 6590 and 6619.

Work is in progress to improve these new forms further in winter-hardiness, grain yield and baking quality by hybridization with varieties such as Äring II, Ankar II, Ergo, and a few Finnish varieties. Back-crosses to Bánkuter 178 are also being made. Other means used in this breeding programme are the crossing of selected lines from an Äring x Atle cross with the best plant material from the Bánkuter 178 strain.

The best variety discovered in breeding for good baking quality is the Hungarian variety Bánkuter 1201 from which some hybrid lines are to be tested for baking quality this winter. Special provisions are made for testing the winter-hardiness of the new forms by growing them under severe winter conditions in lots of about 200 each year.

6590, which combines improved quality with high yield, will probably be put on the market in 1941.

108. ÖSTERGREN, G. 633.11:575.127.2:633.289:576.354.4
A hybrid between *Triticum turgidum* and *Agropyron junceum*.

Hereditas, Lund 1940 : 26 : 395-98.

Hybrids have been obtained between *T. turgidum* (variety Rivet's Bearded) female ($n = 14$) and *A. junceum* ($n = 14$). The hybrids have a chromosome number of $2n = 28$ and studies of meiosis in one hybrid showed associations varying from 7 bivalents plus 14 univalents in some cells to 28 univalents in others. It is suggested from these results that *A. junceum* is not a true autotetraploid.

109. VASSILIEV, B. I. 633.11:575.127.5:633.14:575.1
Wheat-rye hybrids. II. Genetical analysis of crossability of rye with various species of wheat.

C.R. (Doklady) Acad. Sci. U.R.S.S. 1940 : 27 : 598-600.

The crossability as maternal parents with rye of 4 varieties of *Triticum vulgare* and of F_1 and F_2 hybrids between these varieties has been investigated. The results of hybridization do not vary with the rye parent used. The wheat variety *erythrospermum irkutianum* gave an average of 41% successes, while the crossability of the other three varieties with rye varied from 0 to 3.5%. F_1 hybrids between *erythrospermum* and one of the low crossability varieties show a low crossability. In the F_2 it is found that the *erythrospermum* type plants show a high crossability (about 40%), while those F_2 plants which resemble the other parent morphologically are also similar to this parent in having a low crossability (under 5%). Individual *erythrospermum*-like plants in the F_2 show a much higher crossability than is found in the *erythrospermum* parent. It is suggested from these results that crossability depends on a comparatively small number of polymeric factors.

110. NAVALIKHINA, N. K. 633.11:575.127.5:633.14:575.129:581.04
Restitution of fertility in a wheat-rye hybrid through colchicine treatment.

C.R. (Doklady) Acad. Sci. U.R.S.S. 1940 : 27 : 587-89.

A fertile amphidiploid wheat-rye hybrid ($2n = 56$) was produced by the colchicine treatment of the growing points of 3-4 day old seedlings of *T. vulgare* x *S. cereale*.

111. AJROLDI, P. 633.11:575.127.5:633.14-2.451.3
Nuovo contributo allo studio biologico delle "Tilletia". (A new contribution to the biological study of *Tilletia*).

Riv. Patol. Veg. 1940 : 30 : 149-57.

The experiments have shown the fungus to be incapable of infecting the genus *Secale* but the wheat-rye hybrid Terminillo proved quite susceptible.

112. UCHIKAWA, I. 633.11:575.242:575.11
 . 633.11:575.242:576.356.4
(Cytogenetical studies on dwarf compactoid wheat with 42 chromosomes).

Jap. J. Genet. 1939 : 15 : 315-17.

Continuing his work with the compactoid mutation (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 1444), the author has investigated the genetics and cytology of the dwarf compactum I type. Dwarf compactum I, a single plant of which was first found in the progeny of hetero-type dwarf compactum II, resembles its parent in ear type but differs in having a longer and slenderer stem and in being more fertile. The dwarf compactum I plant was selfed and found to be heterozygous, producing normal plants, plants like itself (now called hetero-type dwarf compactum I type), and another type with ears of greater density (= homo-type dwarf compactum I type). On selfing, the normal and homo-type plants bred true and the hetero-type again segregated into the three types.

A cytological study was made of the three types obtained from hetero-type dwarf compactum I and of crosses with normal and B type homotype speltoid. If normal hexaploid wheat ($2n = 42$) has the chromosomes ABC/ABC and B type homotype speltoid ($2n = 40$) the chromosomes AB/AB, then the studies of meiosis in the compactum types and in the hybrids suggest the following chromosome constitutions: hetero-type dwarf compactum I type ($2n = 42$), ACC/ABC; homo-type dwarf compactum I ($2n = 42$), ACC/ACC; hetero-type dwarf compactum II ($2n = 41$), AC/ABC; and homo-type dwarf compactum II ($2n = 40$), AC/AC.

113. ALEXANDROV, W. G. and ALEXANDROVA, O. G. 633.11:581.3
 (The early stages of development of the wheat endosperm and embryo).
 J. Bot. U.R.S.S. 1939 : 24 : 383-96.

The development of the wheat embryo and endosperm are described and illustrated in some detail. Slight differences were observed between varieties, e.g., as between early and late forms. Environment was found also to exert an influence.

114. CHRISTIANSEN-WENIGER and EMRE, E. 633.11:581.6:575
 Anadoluda *Triticum durum*’ da meydana gelen “dönme” danelerin sebepleri ve buna karşı tedbirler. (Causes of the occurrence of “Dönme” grains in *T. durum* in Anatolia and countermeasures).
 T.C. Yüksek Ziraat Enstitüsü Çalışmalarından, Ankara 1940 : No. 102 : Pp. 18 + 16.

The phenomenon known locally as “Dönme” is the occurrence of soft, mealy grains in place of the typical, hard, vitreous grains of *T. durum*. Field observations and pot experiments have shown that it is influenced by soil texture, soil nutrients, water supply and season. Heavy soils, high phosphate content and plentiful water supply increase the proportion of mealy grains.

Since control by cultural methods is impracticable it falls upon the plant breeder to provide varieties resistant or immune to “dönme”. Among the different lines of *T. durum* in Anatolia there are widely different degrees of susceptibility and the experimental provision of conditions favouring the phenomenon is made possible by the conclusions mentioned above. It therefore appears feasible to select resistant lines.

115. RISSO PATRON, R. 633.11:582:576.16(82)
 Descripción de 35 variedades de trigo del país, con observaciones sobre la constancia de algunos caracteres morfológicos. (Description of 35 local varieties of wheat, with observations on constancy of certain morphological characters).

Rev. Fac. Agron. La Plata 1939 : 24 : 57-234.

The author describes the various characters of the plant on which he bases his classification, and which include vegetative characters, characters of the plant during ripening, ear and glume characters, grain characters and finally certain special characters such as coleoptile colour, number of vascular bundles, period of dormancy and phenol coloration of the grain. A key for the determination of the varieties by characters of the growing plant and of the mature ears is given and the individual varieties are described and illustrated, with indications of their origin and sources of further information.

116. CALDWELL, R. M. 633.11-2.4-1.521.6:575.1
Disease resistance in the soft winter wheats.
 Rep. 6th East. Wheat Conf. Wooster, Ohio June 16, 1939 : 4-9. (Mimeo-graphed).

The sources of resistance and the inheritance of resistance in soft winter wheats for the following diseases, leaf rust, loose smut, bunt, scab, mosaic, powdery mildew and stem rust, are outlined. Mention is also made of the physiological races of the fungi.

117. SHANDS, R. G. 633.11-2.421.9-1.521.6:575
Scab resistance in winter wheat.
 Rep. 6th East. Wheat Conf. Wooster, Ohio June 16, 1939 : 9-10. (Mimeo-graphed).

The winter wheat varieties Minturki and Kanred-Red Rock L2010A7-4-1-1 showed a very high degree of resistance to scab (*Gibberella*). Selections from the cross Fultz Brown M1-4 x Minturki have shown both scab and leaf rust resistance.

118. CARTWRIGHT, W. B. 633.11-2.7-1.521.6:575
Breeding for resistance to Hessian fly.
 Rep. 6th East. Wheat Conf. Wooster, Ohio June 16, 1939 : 2-3. (Mimeo-graphed).

Nearly all the standard American wheats have been tested both in the greenhouse and in the

field for resistance to Hessian fly. The most promising material showing resistance includes Illinois No. 1W38, Illinois No. 1 x (Norka-Carina), Java, Marvel, Dixon and Marquillo. Resistance has also been found in vulgare and durum lines imported from Portugal and Spain. A highly resistant durum, F.P.I.94587, approaches immunity in tests and this has been used with very promising results when crossed with vulgare wheats in the breeding work.

119. 633.11:664.641.016
Report of the First Conference of the Hard Red Winter Wheat Quality Advisory Committee, March 30-31, 1939.
 Div. Cer. Crops Dis., Bur. Pl. Ind., U.S. Dep. Agric. 1939 : May 24 : Pp. 5.
 (Mimeo graphed).

Representatives of the states of Kansas, Nebraska, Colorado, Oklahoma and Texas heard reports on the work of the hard red winter wheat quality laboratory on the determination of quality in hard red winter wheat.

120. ENGELKE, H. 633.11:664.641.016:575
 Können Klebergehalt und Kleberertrag durch Züchtung und Düngung erhöht werden? (Can gluten content and gluten yield be increased by breeding and manuring?)
 Landw. Jb. 1939 : 89 : 190-201.

The conclusion is reached that both gluten content and gluten yield of suitable varieties of wheat might be increased by breeding. To combine high yield with high gluten content presents considerable, but not insurmountable, difficulties and will probably be most readily accomplished in spring wheat.

Manuring probably contributes only indirectly towards increased gluten. R. M. I.

121. WORZELLA, W. W. and
 CUTLER, G. H. 633.11:664.641.016:632.111-1.521.6:575.11
Inheritance of quality and cold resistance in wheat and their inter-relationship.
 Rep. 6th East. Wheat Conf. Wooster, Ohio June 16, 1939 : 3-4. (Mimeo graphed).

Preliminary results are given of an analysis of 600 F₃ families from crosses between American Banner, Trumbull and Michikof for the following characters—cold resistance, gluten strength (fermentation time), granulation, carotin, protein, 1,000 grain weight, test weight, seed coat colour, chaff colour, and coleoptile colour. The results indicated that all the characters studied were definitely inherited, only a few multiple factor pairs being necessary to explain the inheritance of quality and cold resistance.

BUCKWHEAT 633.12

122. NISHINA, Y., 633.12:576.312.36:539.185.9
 SINOTÔ, Y. and 633.522:576.312.36
 SATÔ, D.
Effects of fast neutrons upon plants, III. Cytological observations on the abnormal forms of *Fagopyrum* and *Cannabis*.
 Cytologia, Tokyo 1940 : 10 : 458-66.

Seeds of *F. esculentum* and *C. sativa* have been exposed to neutron rays and a cytological study made of the morphologically abnormal plants obtained. The chromosome aberrations found were doubling, translocation, deletion and fragmentation.

OATS 633.13

123. ERICSSON, G. 633.13:575(48.5)
 Svalöfs Vidarhavre. Ny, mycket tidig vithavresort för Norrland. (**Svalöf's Vidar oat—a new very early variety of white oat for Norrland.**)
 Sverig. Utsädesfören. Tidskr. 1939 : 49 : 397-400.

The ancestry and performance of the new Vidar (Å01165) oat and of various competitors, such as Vit Odal [White Odal], Guldregn II [Golden Rain II], etc., are described. Experiments in Norrland have shown that high yield of large plump grains, carliness and resistance to grey spot disease characterize the new variety, which might well replace Vit Odal on the market.

124. NISHIYAMA, I. 633.13:575.127.2:581.48:575.11
(On the evolution of some grain characters in *Avena*).
 Jap. J. Genet. 1939 : 15 : 321-23.

This paper summarizes the author's views on the four grain types—cultivated, intermediate, wild and naked found in hexaploid ($2n = 42$) oats. When a pair of C-chromosomes are lost from oats of the cultivated or intermediate types, the resulting plants with $2n = 40$ are of the wild type. But, when a pair of C-chromosomes are lost from wild type plants, the resulting plants with $2n = 40$ are still of the wild type. It is therefore suggested that in cultivated types the C-chromosome carries a gene or gene group for the cultivated character and another chromosome, the B-chromosome, a gene or gene group for the wild type. The gene group for wild is hypostatic to that for cultivated. In the wild type both B- and C-chromosomes carry gene groups for the wild character. The intermediate type resembles the cultivated type except that the C-chromosome carries a gene group for the intermediate instead of the cultivated character.

Further experiments by the author have shown that the gene or gene group for naked is also carried in the B-chromosome and that cultivated is hypostatic to the naked character. The naked type is thus not multiple-allelomorphic with the cultivated and intermediate types as has been previously reported by others. Thus in the cross wild x naked the author found an F_2 segregation of 12 naked : 3 cultivated : 1 wild. This result also shows that the naked type carries a gene or gene group for the cultivated character in its C-chromosome.

RYE 633.14

125. NILSSON, F. 633.14:575(48.5)
 Rågförsök och rågförädling vid Sveriges Utsädesförenings Västernorrlands-filial. (Rye experimentation and rye improvement at the Västernorrland Branch of the Swedish Seed Association).
 Sverig. Utsädesfören. Tidskr. 1940 : 50 : 4-30.

Rye cultivation and its range and importance in Norrland are outlined with notes on published research on rye at the Västernorrland and other stations.

The performance of numerous recently bred varieties of Swedish, Finnish and Estonian origin (including land varieties) is recorded for different years. The Finnish forms included Halola, Härmä and Toivo; the Estonian rye was Sangaster. The land varieties were the most reliable and earliest in maturing but had long weak straw, low yield and small grain. The improved varieties were good yielders and had short stiff straw and large grain but were not as a rule hardy enough, having been originally cultivated in southern Sweden and therefore lacking the necessary adaptation to winter conditions in Norrland. The varieties Improved Vasa, Malm and Improved Vasa II are hardier than Stål [= Steel], Petkus and Kungs [= King's] and superior to the land varieties in straw characters, yield and size and plumpness of grain—but not in winter-hardiness.

Discussing winter-hardiness in rye, its nature and its relation to fungal attack and weather conditions, the author considers fully the connexion between cold resistance (winter-hardening) and sugar content of the leaves, exemplifying his argument by reference to the unpublished work of G. Anderson, who demonstrated in wheat that with a falling temperature a hardy variety can continue the assimilation process more actively and increase its sugar content much more than a less hardy variety. The greater the amount of carbohydrates produced for storage in excess of the requirements for respiration and growth, the more the cold resistance is increased. Experiments at the Västernorrland Station indicated that similar conditions appear to exist in rye and that the southern Swedish varieties are surpassed by the Norrland ones in their capacity to complete the hardening process and to remain dormant even during mild spells which may have a weakening effect upon the less hardy types.

The Norrland varieties may be regarded as an ecotype of *Secale cereale*, which has resulted from natural selection during 300-400 years for adaptation to the short vegetation period and long winters with severe cold or fungal attack characteristic of northern latitudes.

In outlining the line of research on winter rye breeding with Swedish and Finnish forms at the Västernorrland Station, it is shown that the improvement of Norrland rye has aimed at combining its essential hardiness, adaptation and early maturity with the short, stiff straw and high yield and grain quality of the southern Swedish rye. Numerous crosses have been made and the populations thus obtained have been subjected to natural selection in order to eliminate less hardy segregants before selection of individual plants is begun. The new

Svalöfs Björn rye derived from the cross Improved Vasa x Härmä made at the Station appears to combine hardiness with good straw strength and grain quality. So far its yield in Norrland has been about 20% more than Improved Vasa II. Further improvement in earliness and straw stiffness can probably be attained.

126. KATTERMANN, G. 633.14:576.356.2
Ein neuer Karyotyp bei Roggen. (A new karyotype in rye).
Chromosoma 1939 : 1 : 284-99.

Among 19 plants of different lines of the inbred strain of rye, "Weihenstephaner Winterroggen O₁", three different karyological types were distinguished: a normal type, without any aberrant chromosome form, a homozygous new karyotype in which two varying chromosomes were present as a pair of homologous chromosomes and the heterozygous type in which one normal and one altered chromosome were present in the nucleus. The behaviour of the new T chromosome, considered to be probably a translocation form, is described during meiosis in all three types.

R. M. I.

127. ECKHARDT, R. C. and 633.15:575.12 "793"
BRYAN, A. A.
Effect of the method of combining two early and two late inbred lines of corn upon the yield and variability of the resulting double crosses.

J. Amer. Soc. Agron. 1940 : 32 : 645-56.

While there was on the average no significant difference in yield between crosses of the type (E x E) x (L x L) and those of the type (E x L) x (E x L), where E and L mean early and late inbreds respectively, the first type of cross gave a more uniform crop. The authors consider that the advantage of uniformity outweighs the disadvantage of the different flowering dates of the two single crosses used in producing this type of double cross.

128. WOODWORTH, C. M. and 633.15:575.125:575
BOLIN, O.
Brief description of ear and kernel characters of various single crosses.
Dep. Agron. Agric. Exp. Sta., Ext. Serv. Agric. Home Econ., Univ. Ill.,
Coll. Agric., Urbana, Ill. January, 1939 : Pp. 4. (Mimeographed).

The single crosses are divided into three groups, those rated as desirable female parents for making double crosses, those that may be used as either female or male parents though they are not so good as group 1 for female parents and those that should be used only as male parents.

129. 633.15:575.125:575(73)
Report of the First Southern Corn Improvement Conference
(Organization Meeting) held at New Orleans, Louisiana, November
24, 1939.

Washington, D.C. February 24, 1940 : Pp. 37. (Mimeographed).

Most of this report consists of accounts of the maize breeding and testing being carried out at the southern agricultural experiment stations of the U.S.A. There is also a paper by P. C. Mangelsdorf on the "use of multiple top crosses in southern corn improvement". It is suggested that hybrid corn would never be used as extensively in the South as in the Corn Belt and therefore that a method other than hybrid corn is needed for improving maize in the South. The method suggested is that of combining inbreds in permanent synthetic combinations by the use of multiple top crosses as this method is much better than a straight synthetic when a small number of strains is involved. It is also suggested that once selfed strains of adapted varieties should be used instead of homozygous strains and a breeding procedure is outlined. Finally the report contains a "suggested uniform policy for the release and distribution of inbred lines of corn". It is pointed out that in the Corn Belt two decidedly different policies have been used, some stations releasing their inbred lines to growers who produce both the foundation single crosses and the commercial double crosses while other stations produce their own single-crossed seed which is then sold to the growers. The latter method in which the experiment stations retain control of the inbred lines is recommended for the South.

130. WOODWORTH, C. M. and BOLIN, O. 633.15:575.148

Brief description of inbred lines of corn.

Dep. Agron. Agric. Exp. Sta., U.S. Dep. Agric., Univ. Ill., Coll. Agric., Urbana, Ill. September, 1940 : Pp. 8. (Mimeographed).

Details are given of the origin, the characteristics and the combining qualities of a number of inbred lines of maize.

131. CASTRO, D. Duarte de 633.15:576.16
Qual é a origem do milho? (**What is the origin of maize?**)
Rev. Agron., Lisboa 1939 : 27 : 235-36.

The hypothesis favoured is that the Indians discovered the capacity for "popping" of the seeds of teosinte (*Euchlaena mexicana*), selected the most suitable forms and thus gave rise to the forms now known as maize (cf. "Plant Breeding Abstracts", Vol. X, Abst. 136).

132. LEBEDEFF, G. A. 633.15:576.354.4:576.356:581.036
Failure of cytokinesis during microsporogenesis in *Zea mays* following heat treatment.
Cytologia, Tokyo 1940 : 10 : 434-42.

Young embryos of a cross between two normal inbred lines of maize which did not show either male or female sterility were heat treated and the plants selfed for four generations after the original treatment. In one culture 37 normal diploid plants were found and 1 plant which had 50% bad pollen and the ear approximately half filled. This partial sterility was transmitted to its offspring and a cytological study of pollen mother cell divisions in these plants has been made. Failure of cytokinesis (the division of the extra-nuclear portion of the cell) was observed in the anthers during the premeiotic and the meiotic divisions and was due to the failure of either cell-plate formation or of the cell-plate to continue its normal development. This failure of the cytoplasm to divide leads to the formation of multinucleate pollen grains.

133. CLARK, F. J. 633.15:576.356:575.11
Cytogenetic studies of divergent meiotic spindle formation in *Zea mays*.
Amer. J. Bot. 1940 : 27 : 547-59.

In the condition produced by the recessive factor *dv* the first meiotic metaphase spindle diverges at the poles instead of converging and the telophase chromosomes tend to form several nuclei instead of one (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 734). The nuclear behaviour at first and second divisions of meiosis and in the pollen grains is described in detail and discussed in relation to chromosome mechanics.

134. RHOADES, M. M. 633.15:576.356.2
Studies of a telocentric chromosome in maize with reference to the stability of its centromere.
Genetics 1940 : 25 : 483-520.

The behaviour of a supernumerary chromosome consisting of the short arm of chromosome 5 with a terminal centromere was studied by cytological and also by genetical methods, using marker genes. This telocentric chromosome was found to be unstable. At meiosis, probably when it is unpaired, it is liable to produce isochromosomes by misdivision of the centromere; the isochromosomes thus produced consist of two short arms of chromosome 5 with a median centromere. In somatic cells the telocentric chromosome apparently did not produce isochromosomes, but was subject to loss or structural changes. Since the isochromosomes were much more stable than the telocentric chromosomes from which they derive, the instability of the latter is evidently due to the terminal position of their centromere and this explains why telocentric chromosomes are rarely, if ever, found in normal chromosome complements.

135. MURDOCH, H. A. 633.15:581.481:575.125
Hybrid vigor in maize embryos.
J. Hered. 1940 : 31 : 361-63.

In dissecting the embryos the grains were soaked for 12 hours at room temperature and then 12 hours at 38° F. The scutellum and its attachment and the coleorhiza were all removed

from the embryo. Using this method very consistent dry weights were obtained. It was found that in both the crosses studied the hybrid embryos were heavier than the embryos of either of the parents. The same relation did not hold for grain weight.

136. KOEHLER, B.,
BOLIN, O. and
COPPER, R. R.

633.15-2.482-1.521.6

**Corn inbreds ranked according to their resistance to damage from
Diplodia stalk rot as determined in single crosses in 1939.**

Dep. Agron., Ill. Agric. Exp. Sta. January, 1940 : Pp. 4. (Mimeographed).

No definite cases of dominance of resistance or of susceptibility were observed and in making the calculations it was assumed that both inbreds in a single cross contributed equally to its resistance or susceptibility. The various inbreds have susceptibility ratings from 2.8 to 86.9.

BARLEY 633.16

137. SWENSON, S. P. 633.16:575.11:581.4
633.16:576.312
Genetic and cytologic studies of a brachytic mutation in barley.
J. Agric. Res. 1940 : 60 : 687-713.

Genetical, cytological and morphological studies of a dwarf barley, known as brachytic, which arose spontaneously as a mutation in a plot of Himalaya barley, are reported. The brachytic condition is due to a single recessive gene and linkage studies have shown that the gene is in the seventh linkage group, the cross-over value with chlorina being 9%. Cytological studies of normal and brachytic plants failed to show any difference between them, meiosis and mitosis being regular in both. No significant difference was found in cell size between normal and brachytic plants. It seems possible that the rate of cell division and cell elongation is greater in Himalaya than in brachytic. Brachytic plants grow slower than normal Himalaya but both types germinate, produce corresponding leaves and the first tiller, and head at the same time. The factors for differentiation and maturity thus appear to act independently of the factor for rate of growth.

138. TAVČAR, A. 633.16:575.11.061.6:581.46
Nasljedivanje smeđe-žute boje pljevica kod ječma. (Mode of inheritance
of brownish-yellow glume colour in barley.)
Arhiv Minist. Poljopr. 1936 : 3 : No. 4 : 30-35.

Monohybrid dominance of brownish-yellow glume colour to white was found in crosses of pure lines of white glumed *Hordeum distichum erectum* with pure lines of 4-rowed *H. vulgare nutans* with brownish-yellow glumes. Similarly a monohybrid ratio was found to underly the ear form of the *nutans* and *erectum* types.

The genes for brownish-yellow and for white glume colour (Gg) are linked with the genes (Zz) for number of rows, with an average incidence of 38.55% of cross-over types.

139. GUSTAFFSON, Å. and
ÅBERG, E. 633.16:575.243:537.531:575.113
Two extreme X-ray mutations of morphological interest.
Hereditas, Lund 1940 : 26 : 257-61.

The two mutations, two-flower and lemma-like glumes, were obtained in the X_2 generation of seeds of Golden barley (a typical *Hordeum distichum nutans* type) which had been treated with X-rays. In the two-flower mutation, two flowers are formed within each ordinary lemma. This type is completely sterile and segregates as a recessive. The mutation with lemma-like glumes is completely fertile and has seeds larger than those of Golden barley.

MILLETS AND SORGHUM 633.17

140. HEUSER, W. and
SCHLEIP, H. 633.171-1.524(43)
Die Korn- und Strohleistung der Hirse, insbesondere der Stämme der
Deutschen Hindukusch-Expedition und ihre Verwendungsmöglichkeit im
praktischen Anbau. (The grain and straw yield of millet—in
**particular the strains of the German Hindu Kush Expedition—and
the possibility of utilizing it in practical cultivation.**)

Forschungsdienst 1940 : 9 : 176-83.

The merits and possible uses of millet as a crop plant under present conditions in Germany

were examined in a series of comparative experiments on the yields of grain and straw from various millet species and strains collected in the German Hindu Kush Expedition and also some millets of Polish and German origin. The results showed that:—
Some strains from the Hindu Kush material yielded better than the German and Polish millets tested at the same time.

In view of their drought resistance the *Panicum miliaceum* forms seemed likely to be suitable for light soils not quite capable of carrying oats.

As a short-day plant millet is well suited to late sowings and is therefore useful as a second crop. It also showed less tendency to shedding than is generally assumed.

It is recommended as a cheap catch crop in view of its high yield of grain and the smallness of the grain. Further trials to determine which are the best varieties for this purpose are necessary.

141. SIEGLINGER, J. B.

633.174:575.255.061.6

A sorghum seed color chimera.

J. Hered. 1940 : 31 : 363-64.

In a progeny segregating for red and white seed there occurred a plant with a chimerical panicle part of which bore red seeds and part white seeds with red stripes under the glumes. The different types of seed both gave the same segregation in the next generation, namely 3 red : 1 white and the red striping did not reappear. It is concluded that the chimaera was periclinal as well as sectorial and that the sporogenous tissue had been unaffected.

RICE 633.18

142. NELSON, M. and

ADAIR, C. R.

633.18:575(76.7)

Rice variety experiments in Arkansas.

Bull. Ark. Agric. Exp. Sta. 1940 : No. 403 : Pp. 28.

In the first part of this bulletin the results of yield trials with many varieties for a 9-year period are given in a series of tables. In the second part are given the results for introductions and selections and in the third those for hybrid selections. All the hybrid selections gave very high average yields when compared with standard varieties. Many promising selections have been obtained from the crosses Caloro x Blue Rose, Kameji x Blue Rose and Improved Blue Rose x Fortuna. These hybrid selections are being increased and tested further.

143. ÔRYÔZI, G.

633.18:575.243:537.531

(On the inheritance of two mutations in rice plants induced by X-ray irradiation).

J. Taihoku Soc. Agric. For. 1936 : 1 : 281-96.

Two mutations were induced by X-ray treatment. One of these, "Miniature", was found to be a simple recessive to the normal type. The other, "Striped", is probably caused by the mutation of some chloroplasts from green to white. Green plants obtained from the striped strain do not breed true but always segregate into the three forms, green, striped and white.

FORAGE GRASSES 633.2

144. MÜNTZING, A. and

PRAKKEN, R.

633.24:576.356.5:576.354.4

633.24:576.356.5:631.557

The mode of chromosome pairing in *Phleum* twins with 63 chromosomes and its cytogenetic consequences.

Hereditas, Lund 1940 : 26 : 463-501.

Six triploid ($2n = 63$) plants, obtained from twin seedlings of *P. pratense* L. ($2n = 42$), and their progeny have been examined cytologically. The triploids were found to be larger than the corresponding diploids but the pollen fertility of the triploids was as good as that of the diploids. Diploid *P. pratense* forms 21 bivalents at meiosis. The triploids formed very few trivalents and the number of univalents observed was never higher than 7, thus a typical first metaphase plate in a triploid showed 2 trivalents plus 27 bivalents plus 3 univalents. It is suggested that the formation of so few trivalents in the triploid can only be explained by assuming a "special genotypically controlled tendency to bivalent formation". First anaphases in the triploids showed at least 28 chromosomes at each pole and a correspondingly small number of dividing univalents. The chromosome numbers of 186 plants in the progenies

of the triploids were determined. Not a single plant had less than 56 chromosomes, most plants having about 60, as was to be expected from the meiotic observations on the triploids. The vigour and productivity of the triploid progenies were compared with those of a diploid commercial variety, "Gloria". On the whole the triploid progenies are as vigorous as the diploids in the first summer but in the second year the diploids have a higher productivity. This is probably due to the triploid progenies being less hardy. There were also found considerable differences between the several triploid progenies. The correlation between chromosome number and vigour in the triploid progenies was investigated and it was found that plants having 59-61 chromosomes were less vigorous than those with 56-58. Plants having 56 chromosomes (i.e. exactly 8x) are the most vigorous. Fertility in the triploid progenies is as high as that in diploids.

145. ÖSTERGREN, G. 633.289:575.127.2:576.354.4
Cytology of *Agropyron junceum*, *A. repens* and their spontaneous hybrids.

Hereditas, Lund 1940 : 26 : 305-16.

The chromosome number of *A. junceum* was found to be $2n = 28$, of *A. repens* to be $2n = 42$, of seven spontaneous hybrids between the two species to be $2n = 35$ while another spontaneous hybrid had the number $2n = 49$. Meiosis in the two species was regular but occasional univalents, quadrivalents and bridges were observed. At meiosis in the pentaploid hybrids the maximum pairing was 13 bivalents plus 9 univalents and the minimum 9 bivalents plus 11 univalents. Chromosome bridges were also common. The pentaploids are thus structural as well as numerical hybrids. No first metaphase plates in the heptaploid hybrid were completely analysed. The hybrids were found to be highly sterile.

146. PARODI, L. R. 633.289:582(8)
Estudio crítico de las gramíneas Austral-Americanas del género *Agropyron*. (Critical study of the South American grasses of the genus *Agropyron*).

Rev. Mus. La Plata 1940 : 3 : (N.S.) : Sec. Bot. : 1-63.

The author's study of the South American species of *Agropyron* has convinced him that the genus is polyphyletic, some forms being indistinguishable from certain species of *Elymus*. Many forms appear to be hybrids and some are sterile and only persist by vegetative reproduction.

The species are described in Latin and Spanish and the descriptions are supplemented with illustrations, details of the geographical distribution, and suggestions as to possible relationships. Twelve species and 12 varieties are described from Argentina, Chile and Uruguay, 2 of the species being adventive from Europe and 3 of them new. A number of modifications are made in the existing classification and descriptions.

LEGUMINOUS FORAGE PLANTS 633.3

147. SCHELHORN, M. v. 633.3:575.127.5:635.656
Über eigene und fremde Versuche zur Art- und Gattungsbastardierung bei *Vicia*, *Lens*, *Pisum* und *Lathyrus*. (On experiments of the author and others on interspecific and intergeneric hybridization in *Vicia*, *Lens*, *Pisum* and *Lathyrus*).

Forschungsdienst 1940 : 9 : 70-78.

This well documented article presents a useful critical survey of observations and experiments on interspecific (and some intergeneric) crosses in the above mentioned genera, and also records briefly the author's own results in his endeavours to obtain interspecific hybrids. From the cross *Vicia narbonensis* var. *integrifolia* x *V. narbonensis* var. *intermedia* the author obtained 4 pods containing 14 seeds, eleven of which germinated. Ten produced weak, chlorotic plants which resembled the female parent and died without flowering. The eleventh plant was somewhat darker in leaf colour and more vigorous but not as healthy looking as the parents. It appeared more intermediate in type and produced some light lilac coloured flowers which set no seed. From the reciprocal cross out of fifteen flowers pollinated one pod with two seeds which did not germinate was obtained.

His attempt to cross *Pisum sativum* and *P. arvense* in both directions with *Lathyrus Aphaca*, *L. tuberosus* and *L. hirsutus* was unsuccessful.

The possible cytological and other causes of failures of various crosses are suggested and the potential value of many of the hybrid forms whose production has been attempted is considered.

Many of the papers cited in the bibliography have already been reviewed in "Plant Breeding Abstracts".

148. NICOLAISEN, W.,
LEITZKE, B. and

WITZIG, I.

633.32-2.421.6-1.521.6:575

Untersuchungen im Rahmen der Züchtung der Kleearten auf Widerstandsfähigkeit gegen den Kleekrebs (*Sclerotinia trifoliorum* Erikss.) [Investigations bearing on the breeding of clover species for resistance to clover stem rot (*S. trifoliorum* Erikss.)]

Phytopath. Z. 1939 : 12 : 585-645.

The present paper is mainly concerned with a study of the biology of the fungus, especially with physiological specialization, the alternation of generations and the sexual behaviour. The working out of a suitable, practical method of infection, and of the investigation of the occurrence of physiological races and the resistance of species, varieties and local strains of clover are also considered.

R. M. I.

149. SVESCHNIKOVA, I. N. 633.35:575.127.2:576.312.34:575.125
Cytogenetical analysis of heterosis in hybrids of *Vicia*.
J. Hered. 1940 : 31 : 349-60.

Cytogenetical studies have been made on the following vetches: *V. amphicarpa* ($n = 5$) with a subterminally constricted *A* chromosome and no *F* chromosome; *V. sativa* ($n = 6$) with a median constriction in the *A* chromosome and a small *F* chromosome; *V. angustifolia brachisomica* with one of the arms of the *A* chromosome longer than in *V. sativa* and a longer *F* chromosome; *V. angustifolia dolichosomica* with both arms of the *A* chromosome longer than in *V. sativa* and with a still larger *F* chromosome. Differences in the number of basal branches, the degree of reflexion of the standard and wings and the number of flowers per raceme go parallel with the differences in respect of these two chromosomes among the different types. The *E* chromosome also varies in size and its variations are correlated with differences in the branching along the stem, size of leaflet and height of plant.

In F_1 hybrids there was usually increased vigour but one form of *V. angustifolia brachisomica* with narrow leaves and rather stout stems when crossed with *V. angustifolia dolichosomica* gave very dwarfed F_1 plants, which the author describes as showing minus heterosis. In the cross between *V. sativa* and *V. angustifolia dolichosomica* the F_2 produced 6% of chlorophyll deficient dying early and 26% which survived in an etiolated condition.

In general, the author states, the characters of plants with longer chromosomes were dominant in the hybrids.

ROOTS AND TUBERS 633.4

150. OLSSON, P. A. 633.4:581.143.26:575
Stocklöpningen i rotfruktskulturer under vegetationsperioden 1938. (Bolting in root crops during the vegetation period 1938).
Sverig. Utsädesfören. Tidskr. 1939 : 49 : 326-35.

The results of a bolting trial undertaken by the Swedish Seed Association in Svalöf showed that: among the sugar beet strains Kleinwanzleben E and the Svalöf strain 015 displayed least tendency to bolt; the Alfa strain 041 (in plot 19) had few bolters as compared with strain 09; two plots of the Svalöf Barres Halvlång [Svalöf Barres Half Long] strain 01 were markedly resistant to bolting; and the Swede and turnip strains were extremely prone.

151. LEVAN, A. 633.41:581.331.2:575-181
Abnorm utformning av pollen inom ett pollentack av *Beta*. (Abnormal pollen formation in a pollen sac of *Beta*).
Bot. Notiser 1939 : 463-65.

The anomalous type of cell recorded occurred in pollen sacs adjacent to normal pollen sacs in a single anther of an apparently otherwise normal plant from among some inbred lines of beet used for commercial seed production at Hilleshög.

The abnormal pollen sac contained mainly cells of very different size and shape, mostly much distended and up to 50 times larger than normal pollen grains, but also some cells that were very small. In some of the giant cells tetrad formation was observed but the most aberrant bore no other resemblance to pollen grains; most were either empty or contained shrunken plasma and sometimes a cell nucleus. Bordering on the normal pollen sac some giant cells completely resembling large pollen grains were observed, but whether they originated from the normal or abnormal pollen sac could not be decided.

Pollen grains from the normal sac, but in the region of the septum, had a slightly larger diameter than grains from other regions of the same sac.

The average diameter measurements for the abnormal pollen and for the pollen of the hexaploid *Beta trigyna* were 23.98 ± 0.75 and 23.64 ± 0.38 respectively.

Changes in the sub-epidermal cells (which give rise to the archespores) or cell disturbances following an increase in chromosome number are possible causes of the abnormal pollen formation, though the author regards stimulation of cell growth by some external agency or by gene mutation disturbing the mechanism of cell development as a more probable cause of the anomaly.

152. STEVENSON, F. J. 633.491:575(73)
Potato varieties recently distributed to growers in the United States.

Amer. Potato J. 1940 : 17 : 217-35.

This is an account of the yields and other characteristics of the following potato varieties—Chippewa, Earlaine, Houma, Katahdin, Mesaba, Nittany Cobbler, Pennigan, Pontiac, Red Warba, Sebago, Sequoia and Warba—when grown in several states. Chippewa, Houma, Katahdin, Sebago and Sequoia are the most promising varieties.

153. GUERN, A. P. 633.491:575.14
(On self-pollinated strains of potatoes).

Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1940 : No. 7 : 29-36.

Mention is made of a number of successful varieties, including Paterson's Victoria and Early Rose, that were obtained by self-pollination of existing varieties and special emphasis is laid on the possibility of obtaining earlier maturing varieties in this way. The author therefore set out to produce by self-pollination lines that would be more suitable for use as pollen parents than the commercial varieties at present used for this purpose. The first generation of selfed seedlings gave yields varying from 20 to 40% below that of plants from tubers; some varieties gave much better selfed progenies than others. Only 5-6% of the total seedlings were fertile and some varieties gave no fertile seedlings; many dwarfs, chlorophyll deficiencies and other aberrations occurred among the seedlings. The third and later generations were somewhat freer from these anomalies and slightly better in yield; the proportion of fertile seedlings was distinctly higher and in the fifth and sixth generations some lines containing up to 80% of fertile seedlings were obtained, the plant vigour and yield being more or less normal. Segregation continued even into the sixth and seventh generations, particularly in respect of tuber colour.

Hybrids between these inbred lines were not equal to the initial material in yield but the selfed progeny of the hybrids contained some high yielding seedlings, some surpassing the standard variety in yield, and some in earliness of tuber formation.

The author expresses the view that almost any potato variety can be made fertile by selfing for 5-6 generations and that the present-day varieties are too heterozygous and would gain by a certain amount of inbreeding.

154. WERNER, H. O. 633.491:576.16:631.557
Performance of clonal strains of Triumph potatoes. I. Triumph strains on dry land in western Nebraska.

Amer. Potato J. 1940 : 17 : 66-80.

Under quite widely diverging climatic conditions at Alliance, western Nebraska, it was shown that there were a few distinct constant differences between the variously maturing strains of Triumph potatoes. The later strains yielded better in all but the very dry and drought years whilst early types produced the smoothest, best type of tuber. Early types almost always produced more tubers of a size most desirable for seed (No. 2: $1\frac{7}{8}$ "- $1\frac{1}{2}$ " diam.). On the whole it was concluded that mid-season strains were most suitable for tuber production. J. G. H.

155.

PERLOVA, R. L.

633.491:576.356.5:581.036

633.491:575.127.2

Production of an autohexaploid *Solanum Vallis Mexici* Juz. by means of its cultivation at the Pamir.

C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : 25 : 419-22.

Temperature extremes in the Pamir, near Khoroz, where the climate is dry and the diurnal fluctuation of temperature large, are believed to have disturbed reduction division in the sterile triploid *Solanum Vallis Mexici* ($2n = 36$) so that unreduced gametes were formed. Seed was set late in 1937 and the seedlings grown from this in 1938 were shown to be hexaploid, the somatic chromosome number varying from 70 to 73. The hexaploid differs from the original triploid in several quantitative characters. Crosses have been effected between it and *S. tuberosum* variety Stärkeragis.

Although Bukasov considered that *S. demissum* had been formed by chromosome doubling in *S. Vallis Mexici* or some related triploid type, the hexaploid mentioned above is very unlike *S. demissum*. Hence it is considered unlikely that *S. Vallis Mexici* played any part in the formation of *S. demissum*.

J. G. H.

156. LIVERMORE, J. R. and

JOHNSTONE, F. E. (jun.)

633.491:581.162.5:576.356.5

The effect of chromosome doubling on the crossability of *Solanum chacoense*, *S. Jamesii* and *S. bulbocastanum* with *S. tuberosum*.

Amer. Potato J. 1940 : 17 : 170-73.

Crosses have been attempted between *S. tuberosum* ($2n = 48$) and diploids ($2n = 24$) and colchicine produced tetraploids of the wild diploid species *S. bulbocastanum*, *S. chacoense* and *S. Jamesii*. All the pollinations involving both diploids and tetraploids of *S. bulbocastanum* and *S. Jamesii* were unsuccessful. Crosses between *S. tuberosum* and *S. chacoense* diploid produced occasional seeds but a much higher set of plump seeds was obtained when the tetraploid of *S. chacoense* was used either as male or female parent.

157. JAŠČUK, A. P.

633.491-1.8:575

(Reaction of potato varieties to manuring).

Ovoščevodstvo (Vegetable Growing) 1940 : No. 1 : 39-42.

Some varieties, such as Deodara, have proved much more responsive than others and tests of the standard varieties and the seedlings undergoing selection have been carried out under different conditions of manuring. The response to manuring in some forms was nearly twice that of others and the relative order of the varieties was quite different under high and under low manuring. This illustrates the importance of carrying out selection under the best possible conditions of cultivation when breeding varieties designed for intensive farming.

158.

633.491-2-1.521.6

New *Sequoia* potato is widely acclaimed.

Ext. Farm-News 1940 : 25 : No. 12 : p. 4.

A new late potato variety, the Sequoia, shows marked resistance to leaf hoppers, flea beetles and blight and has outyielded established varieties such as Cobbler, Katahdin and Chippewa during a five year test period.

159. STEVENSON, F. J.

633.491-2-1.521.6:575(73)

Potato disease control by breeding resistant varieties.

Trans. Iowa Hort. Soc. 1939 : 74 : 221-35.

In this talk the author gives an outline of the National Potato Breeding Program of the U.S.A. Among the problems being tackled are the breeding of varieties resistant to virus diseases, to late blight and to common scab. A variety which is immune to latent mosaic has been obtained and further research has shown that it transmits this immunity in definite ratios to offspring. Resistance to mild mosaic is also a heritable character. Tolerance and resistance to leaf roll is also reported to have been found in other varieties. In the blight resistance work promising results have been obtained from families of blight resistant varieties or seedlings crossed with Katahdin. Progenies from Katahdin naturally fertilized and from Chippewa x Katahdin have contained the most resistant seedlings. One selection from the cross Chippewa x Katahdin has been named Sebago and distributed to growers. Sebago gets blight but is never severely injured. Scab resistance has been found to behave as a recessive

character. All varieties so far produced which are resistant to scab are late maturing and it has not yet been possible to produce an early which is scab resistant. Lateness appears to behave as a dominant and the problem of selecting an early, scab-resistant potato is not easy.

160. BONDE, R., STEVENSON, F. J. and CLARK, C. F. 633.491-2.411.4-1.521.6:575
Resistance of certain potato varieties and seedling progenies to late blight in the tubers.

Phytopathology 1940 : 30 : 733-48.

The resistance to *Phytophthora infestans* of tubers both in the field and in the laboratory and of foliage in the field was investigated, using a number of potato varieties and their progenies. The tubers of the varieties Paisley No. 2, President, 336 114 and 336-18, showed no infection with the fungus when other varieties were badly damaged. Resistant tubers were found in the progenies of crosses between susceptible and resistant varieties and also in a family from Katahdin selfed, although Katahdin itself is a susceptible variety. Haulm resistance and resistance to tuber rot occur together in relatively high percentages in certain progenies but the results also suggest that tuber resistance is not controlled by the same genetic factors as haulm resistance. The foliage of certain varieties may escape infection in the field not because it is resistant but from the possession of certain growth habits. Resistance of tubers depends to a certain extent on maturity, young tubers of resistant varieties being susceptible. Tuber resistance may be due to certain morphological characteristics but in other cases it is physiological, the fungus only growing very slowly in the infected tubers of a resistant variety. An attempt to increase the virulence of a strain of *Phytophthora* by propagating it on resistant varieties was unsuccessful.

161. MÜLLER, K. O., MEYER, G. and KLINKOWSKI, M. 633.491-2.411.4-1.521.6:575.17
Physiologisch-genetische Untersuchungen über die Resistenz der Kartoffel gegenüber *Phytophthora infestans*. (Physiological-genetical investigations on the resistance of potatoes to *P. infestans*).

Naturwissenschaften 1939 : 27 : 765-68.

A study of the reaction of the cells of the host to the parasite suggests that the difference between genetically resistant and susceptible plants is due to the speed of reaction of the cells of the host and the resultant slowing down of the development of the parasite. By keeping a susceptible tuber at -3-4° C. it is possible to produce the same result, i.e. the non-development of the parasite, as in a resistant tuber kept at 19° C. The function of the gene which differentiates the resistant W varieties from the usual cultivated varieties suggests an analogy with the sex realizer. R. M. I.

162. RATERA, E. L. 633.491-2.8-1.521.6
 633.491-2.1-1.521.6
Valor agrícola de algunas especies indígenas de *Solanum* (*Tuberarium*) de la República Argentina. [The agricultural value of certain indigenous species of *Solanum* (section *Tuberarium*) from the Argentine].
 Rev. Fac. Agron., B. Aires 1938 : 9 : 23-29.

A study was made of virus, fungus and insect attacks on six indigenous wild species and seven unnamed forms. Yield, vegetative period, resistance to drought and frost, and cooking and commercial qualities were also studied. The only promising species were *S. Millanii* for its resistance to low temperatures and No. G.1345 from La Pampa for drought resistance. *S. Parodii*, *S. Garciae* and No. G.1345 showed no signs of virus attack. J. G. H.

163. JONES, L. K., VINCENT, C. L. and BURK, E. F. 633.491-2.8-1.521.6:575
The resistance of progeny of Katahdin potatoes to viroses.

J. Agric. Res. 1940 : 60 : 631-44.

This paper reports further tests which have been made in order to obtain more information on the value of Katahdin as a parent in the production of virus resistant potato seedlings

(for previous tests, cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 542). It was found that practically all the viroses (both mottling and necrosis) observed in field plantings prior to 1938 were due to the vein-banding (= Y) virus. New stocks of the varieties U.S.D.A.46000, Earlaine and Houma became 100% infected with vein-banding in the first year but Katahdin was only 35% infected. In the second year the carefully rogued stock of Katahdin showed only a 5% reduction in yield. In 1938 and in 1939 seedlings were mechanically infected with the Y virus in the greenhouse before being planted out. A high percentage of resistant seedlings was found in many crosses, but in all cases the resistance of seedlings to field infection was very much less, only families having Katahdin as a parent containing seedlings resistant to vein-banding in the field. Tubers of several varieties were also planted in the same field as the seedlings. Many varieties became 100% infected with vein-banding in two years but others showed considerable resistance to infection (U.S.D.A.46842 and 47208, 0% infection; Chippewa, 1.9%; U.S.D.A.47196, 2.8% and Katahdin 12.9% infection). Observations on seedlings raised from seed obtained from vein-banding affected plants showed that the Y virus is not seed transmitted. In 1938 and in 1939 a serious new virus infection was observed in potatoes, resulting from the curly top virus of sugar beet and it is thought that Katahdin and Katahdin progeny may be more susceptible than other varieties to this virus. Katahdin and Katahdin seedlings were found to be resistant to infection with tobacco mosaic virus by inoculation, but they could be given this disease by grafting. One variant of potato latent mosaic (= X virus) consistently produced 100% infection of Katahdin plants by mechanical inoculation, although Katahdin is immune to the common strain of X virus.

164. AGERBERG, L. S.

633.491.00.14(48.5)

Sortförsök med potatis i Norrbotten 1914–1938. (**Variety trials with potatoes in Norbotten 1914–1938.**)

Sverig. Utsädesfören. Tidskr. 1939 : 49 : 307–25, 377–96.

A detailed account is given of the performance of numerous varieties and land sorts of potatoes in extensive Swedish trials from 1914–38. Yields, quality, earliness, disease resistance and keeping properties are discussed and a useful table of varieties indicates their most important features and some diagnostic characters. The identification of synonyms has also formed part of the investigation.

The outstanding variety in the Norbotten trials has been Eigenheimer, which has surpassed most of the others in yield of tubers, and all in yields of starch or dry substance per hectare. Its flavour is excellent and its keeping quality should be satisfactory with proper precautions. It can be regarded as a quite early and high yielding potato suitable for table or fodder purposes in upper Norrland.

Wekaragis is recommended as a wart resistant type specially suited for use as fodder. It exceeded Eigenheimer in yield.

165. SAL'KOVA, A. K.

633.492–1.524:581.6

(**The biochemical investigation of the sweet potato under the conditions of Apsheron.**)

Soviet Subtropics 1940 : No. 9 (72) : 51–53.

Estimations of the starch, sugar, nitrogen and moisture content were carried out in 9 varieties. The starch content varied from 14.72 to 20.56% according to variety, the sugar content from 0.99 to 2.04%, protein 2.13 to 4.00 and water 0.79 to 1.53%. In certain other tests somewhat wider differences were observed, e.g. starch 10.89 to 20.56%, sugars 0.99 to 4.60%.

FIBRES 633.5

166. MARTINS, R. F. C.

633.51:575(81)

Algodão. (**Cotton.**)

Rev. Soc. Bras. Agron. 1940 : 3 : 214–26.

The author, when he started work in 1924, found the São Paulo cottons extremely mixed and low in quality and in yield. Variety tests were started and showed the locally grown varieties to be markedly inferior to Texas Big Boll, Express and others imported from the U.S.A., which were therefore immediately multiplied. By 1927 promising selections had been made from Express and Texas Big Boll. A line selection from the latter variety gave rise to Piratininga 086, characterized by the length, silkiness and whiteness of its lint and its large bolls. In 1932 the variety 21077, distinguished by very high ginning percentage (38), was produced by selection from Express. All these varieties excelled the old ones in yield, quality and adaptation to local conditions.

After the arrival of Harland a further large collection of imported varieties was tested and U4,3 declared to be most suited to São Paulo conditions but after extensive testing in different parts of the country it was found to be a failure.

167. BALTAZAR, E. P. and CHAKRABANDHU, M. C. 633.51:581.162.32
A study of some of the important characters of cotton varieties grown from selfed and unselfed seeds.
 Philipp. Agric. 1940 : 29 : 150-72.

The objects of this work were to compare cotton plants raised from selfed seeds with those grown from unselfed seeds within five important varieties of imported cotton and also to study the agronomic and morphological characters of each variety. The varieties of cotton studied were Pima Egyptian Lot I and Lot II, Giza 7, Giza 12 and Giza 19. Cotton plants grown from unselfed seeds were more vigorous than those grown from selfed seeds and yielded higher. No vicinists were found in the progeny of selfed Pima Egyptian plants and about 4% of vicinists in plants from unselfed seed of this variety. For the other varieties about 4% of vicinists were found in plants from both selfed and unselfed plants.

168. HARLAND, S. C. 633.51:582
Taxonomic relationships in the genus *Gossypium*.
 J. Wash. Acad. Sci. 1940 : 30 : 426-32.

The author considers the papers of Hutchinson and Ghose (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 341) and Hutchinson (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 55) on the taxonomy of the genus *Gossypium* to be accurate and painstaking in so far as they deal with the Asiatic cottons but suggests that the treatment of the other groups is less satisfactory. The present author points out that *G. Davidsoni* and *G. Klotzschianum* do cross with cultivated New World cottons to produce vigorous seedlings, which, however, die when young from a progressive necrosis of the cotyledons. Secondly there are no good reasons for classifying the two Australian species, *G. Sturtii* and *G. Robinsonii*, with the New World diploid cottons. Thirdly the present author objects to certain changes in the taxonomic status of some species in the tetraploid New World cottons from that found in the schemes originally suggested by him (cf. "Plant Breeding Abstracts", Vol. III, Abst. 240 and Vol. IX, page 488). In particular he still considers that the Bourbon group is distinct from the Upland group on both morphological and genetical grounds, and that the Bourbon group should continue to be known as *G. purpurascens* Poir. rather than as a variety of *G. hirsutum*.

169. ZEMIT, V. 633.52:575(47)
(Achievements in breeding fibre flax in the ten years 1929-1939).
 Len i Konoplja (Flax and Hemp) 1940 : No. 5 : 30-33.

In 1940 the whole flax area of 1,800,600 ha. has been brought under improved seed. The new varieties are superior to the old in yield and quality of fibre but are mostly lacking in disease resistance. Certain varieties combining high fibre yield with resistance have recently been produced and distributed and lines resistant to *Fusarium* are now becoming available. The ancient land races are being subjected to selection and recourse has also been had to hybridization between varieties and with wild flax. Tetraploids have been produced by treatment with high temperature and with colchicine. Intravarietal crossing has not given any increase in yield over uncrossed seed from the plants used for the cross.

Some of the varieties under test combine resistance to drought and lodging with other valuable properties. They are multiplied rapidly by growing with wide spacing and sending the seed to the south to be grown in the winter.

170. ZEMIT, V. E. 633.52:575.3
(The influence of wide spacing on the hereditary variation of varieties of fibre flax).
 Len i Konoplja (Flax and Hemp) 1940 : No. 1 : 40-43.

Seed was taken from plants grown under wide spacing and from others from close spacing; the seedlings from each were grown under identical conditions but the seed from the widely spaced plants gave rise to individuals that were more vigorous and had a higher yield of both fibre and seed.

171. . . BORODITCH, Z. N. 633.52:581.162

(On the problem of biology of flowering of flax).

Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1940 : No. 7 : 19-26.

The floral biology is described with reference to a number of different types of flax. The flowers are protogynous. The stigma in emasculated flowers retained its receptivity for 6 days and the pollen retained its viability from 5-6 days. The amount of pollination occurring when emasculated flowers were left exposed was 7-10%. By cutting off the style at varying periods after pollination the interval between pollination and fertilization was shown to be 2-3 hours. It was also found possible for fertilization to be effected on the day before the opening of the flower.

When a white flowered flax was pollinated with a mixture of its own pollen and pollen from other, blue flowered varieties, 72.3% of the progeny had blue flowers. Moreover, when several blue flowered varieties were used together, some proved more effective pollinators than others. The progeny of white flowered plants flowering in the open in proximity to blue contained a number of individuals with blue flowers, showing the occurrence of natural cross-pollination, though on a very small scale.

172. . . 633.52:582

KUGLER, W. F. and

633.854.54

REMUSSI, C.

633.52-2-1.521.6(82)

Algunas características morfológicas, fitopatológicas y de resistencia a las heladas en variedades agrícolas de lino cultivadas en la Estación Experimental de Pergamino, durante los años 1937 y 1938. (Certain characteristics of morphology, disease resistance and frost resistance in agricultural varieties of flax cultivated at the Pergamino Experimental Station in 1937 and 1938).

"Granos" Semilla Selecta, B. Aires 1939 : 3 : No. 3 : 3-24; No. 4 : 3-38.

The authors describe the characters employed in their classification: these include characters of the flower, fruit and seed; also such features as earliness, the number of days from germination to flowering varying from 60 to 90. The period from flowering to seed maturity was often longer in the very early flowering varieties, so that the total vegetation period did not show such wide variations as the period from germination to flowering. Observations were also made on resistance to wilt (*Fusarium lini*), and to rust (*Melampsora lini*), there being indications that the physiological forms of the latter parasite present are distinct from those of Europe and North America; certain varieties have proved resistant. Differences were also observed in resistance to *Septoria linicola* and to frost.

The observations were made on 319 specimens from nearly all flax growing countries of the world and included fibre and oil types and also a number of intermediates.

173. . . TSEITLIN, G. 633.522:575(47)

(Southern ripening hemp).

Len i Konoplja (Flax and Hemp) 1940 : No. 5 : 54-55.

The selection described is superior in yield and quality of fibre.

SUGAR PLANTS 633.6

174. . . ARTSCHWAGER, E. 633.61:581.4:582

Morphology of the vegetative organs of sugarcane.

J. Agric. Res. 1940 : 60 : 503-49.

This description of the morphology of the vegetative organs of sugar cane varieties is more complete in its scope than the one recommended by the International Society of Sugar Cane Technologists. In nearly every case the descriptions of the various organs are illustrated by very clear diagrammatic drawings. The organs treated are the stalk (or culm) and the leaf. The morphology of the stalk is divided into the following sections—the internode, the structure of the stem epidermis, the node and the bud. Microscopic as well as macroscopic studies were made. In treating the morphology of the leaf, the following topics are discussed—the leaf blade, the leaf sheath, the dewlaps (or joint triangles), the ligule and the auricles. In the whole of the article special attention is paid to the arrangement of hair on buds and leaves, the system of numbering the groups of hairs being that developed by Jeswiet in Java. Finally there is a discussion of the constancy of the different characters and hence their importance in describing varieties.

175. STEWART, D.,
LAVIS, C. A. and
COONS, G. H. 633.63:575.125:581.162.32:575(73)
633.63-2.484-1.521.6:575
Hybrid vigor in sugar beets.
J. Agric. Res. 1940 : 60 : 715-38.

Inbred strains of sugar beet were obtained by growing selected beets of the strains at some distance from other beets. Such inbred strains must be self-fertile and, when two such strains are brought together to produce a hybrid, there is produced a certain amount of selfed seed in addition to the hybrid seed. In the single crosses reported in this paper the amount of cross-pollination was found to vary from as much as 90% to less than 10%.

Hybrid seed from single crosses has been compared with the selfed seed of two parent strains and with the seed of Pioneer (a commercial variety) for yield of roots, percentage sugar content and yield of sugar. The results are given in a series of tables. Most of the 16 inbred strains used, some of which are the product of many generations of inbreeding, were very similar in yield to Pioneer. Two strains were superior and two strains inferior to Pioneer in yield of roots. In most cases the hybrids showed a significant and high (about 25%) increase in root yield over that of the parents and also in many cases over that of Pioneer. This increase in yield can be attributed to hybrid vigour. The mean sucrose percentages of the hybrids were about the same as those in Pioneer. Thus many crosses have a higher yield of sugar per acre than Pioneer.

Several of the inbred strains showed a high resistance to leaf spot (*Cercospora beticola*) and appeared to transmit this character as a dominant to their hybrids. The hybrid strain U.S.217 (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 368), which is resistant to leaf spot, was obtained from crosses between five inbred strains described in the present paper.

STIMULANTS 633.7

176. NAGEL, L. 633.71:577.17:576.16
Morphogenetic differences between *Nicotiana alata* and *N. langsdorffii* as indicated by their response to indoleacetic acid.
Ann. Mo. Bot. Gdn. 1939 : 26 : 349-72.

The corollas and flower stalks of *N. alata* and *N. Langsdorffii* were used in a study of the role of growth hormones in morphogenesis.

The results suggest that many of the main differences between the two species lie in a genetically controlled difference in their capacity to utilize hormones.

177. MARKWOOD, L. N. 633.71:581.192:581.6
Nornicotine as the predominating alkaloid in certain tobaccos.
Science 1940 : 92 : 204-05.

It was found that 95% of the total alkaloids in a low-nicotine strain consisted of a base identified as nornicotine. It is suggested that in low-nicotine strains nature compensates for the repression of nicotine by synthesizing this closely related parent alkaloid.

178. KOENIG, G. 633.71:581.6:575
Die Entwicklung der Reichsanstalt für Tabakforschung in Forchheim in zwölfjähriger Tätigkeit (1927-1938). [The development of the State Institute for Tobacco Research in Forchheim in the course of twelve years' work (1927-1938)].
Landw. Jb. 1939 : 89 : 651-68.

The brief section on breeding describes satisfactory results regarding the types under cultivation and the breeding of new local races.

Crosses have been made with foreign élite varieties. The production of plants naturally "free" from nicotine has been successful. The nicotine present is held to be non-poisonous.

The production of a light Virginia tobacco has been so greatly increased as to make imports from the U.S.A. unnecessary.

The possibility is noted that a stemless Rustica tobacco leaf may be produced by breeding.

R. M. I.

179. NOLLA, J. A. B. 633.71-2-1.521.6:575(84)
Second Annual Report of the Tobacco Institute of Puerto Rico.
 San Juan 1939 : Pp. 36.
 ESTEVA, C. (jun.)
Third Annual Report of the Tobacco Institute of Puerto Rico.
 San Juan 1940 : Pp. 50.

The breeding programme at this institute is mainly concerned with the isolation of strains resistant to both mosaic and black shank (*Phytophthora parasitica*) from crosses between varieties resistant to one of these two diseases only. Attempts are also being made to improve the commercial characteristics of cigarette tobacco varieties. Tests of strain and varieties are carried out and a survey is being made to find varieties suitable for the manufacture of nicotine insecticides.

180. FLUITER, H. J. de 633.71-2.484-1.521.6:575(92)
 Proeven en waarnemingen in verband met de bestrijding van het bruinvlekk, *Alternaria longipes* (Ell. et Ev.) Mason. [Experiments and observations in connexion with the combating of brown spot *A. longipes* (Ell. et Ev.) Mason].
 Meded. Besoek. Proefst. 1939 : No. 65 : 1-40.

Selection experiments showed that tobacco plants of Hybrid 238 and of the cross 238 x Canari were very susceptible to brown spot and that lines 320 and 322 of Kedoe were much less susceptible than lines 103 and 303.

Field experiments gave further evidence of marked individual differences in the susceptibility of plants. A mother tree, selected for its resistance to *Alternaria*, though growing in a heavily infected stand of Kedoe, is being crossed with Kedoe 103.

Prospects of obtaining resistant forms by breeding are considered promising.

181. COSTA, A. S. and 633.71-2.8-1.521.6
 LIMA, A. R.
 Sôbre variedades de fumo que localizam o vírus do mozaico comum (*Nicotiana virus 1*). [Varieties of tobacco that localize the common mosaic virus (*Nicotiana virus 1*)].
 Rev. Agric., S. Paulo 1940 : 15 : 209-13.

Varieties containing Holmes' factor *N* (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 915) have been introduced and are to be crossed with the local varieties with the object of introducing into them the gene for necrotic response.

182. SAMARINA, A. P. and 633.72:575:581.45
 KOLELIŠVILI, M. V.
 (The anatomical method in tea breeding).
 Soviet Subtropics 1940 : No. 9 (72) : 30-33.

Sections were made of the leaf and measurements made of the thickness of the leaf, of the cuticle and of the epidermis, the length of the palisade parenchyma, the thickness of its cells, the number and size of stomata and the size of the cells of the upper and lower epidermis. The least constant of the characters were the leaf thickness, the length of the palisade parenchyma, the thickness of the spongy parenchyma and the number of stomata per unit area, all of which vary greatly with ecological conditions; the leaf is invariably thicker and coarser in dry areas. The ratio of palisade to spongy parenchyma was greater in varieties from dry zones, presumed to be more drought resistant. Descriptions and illustrations of certain selected bushes are furnished.

183. VOLLEMA, J. S. 633.72:581.142:578.08
 Het versnellen van de kieming van theezaden. (Increasing the rapidity of germination of tea seeds).
 Bergcultures 1939 : 13 : p. 1012.

ANONYMOUS.

Nogmaals het versnellen van de kieming van theezaden. (Once again—on increasing the rapidity of germination of tea seeds).
 Bergcultures 1940 : 14 : 685-87.

The attention of the West-Java Experiment Station has been drawn to a method devised for increasing the speed of germination of tea seeds. It consists in laying the seed for some

days between damp sacks on the seed beds and then exposing it for a quarter to half an hour to sunshine, after which it is again laid between the sacks on the seed beds where the burst seed can be gathered next day. Tests showed that this treatment had no injurious effect on the germination or development of the plants.

The exact measures and times adopted by the West-Java Experiment Station in using this method are given in the first of the two papers under review. The second paper contains the results of experiments confirming the value of the germination method already recommended and a note mentioning its successful application also for germinating seed of *Aleurites montana*.

184. SNOEP, W. 633.73:581.165.71:575
 Toepassing van takenten in de praktijk. (**Utilization of lateral scions in practice**).
Bergcultures 1940 : 14 : 482-92.

A full account is given of existing knowledge on the various types of wood and branches formed by the coffee plant and of the various types of grafting material and their uses. The suitability of various clones for the production of desirable types of branching and as a source of grafting material is exemplified by reference to forms such as SA13, BP42, Moemb. III-04 and T.P.2. It is also expected that the combinations SA567 x BP42, SA34, T.P.21 x BP42 (and its reciprocal) and BP42 x Com. SA36 (and its reciprocal) should produce suitable material for use in grafting.

A comparison of 29 clones showed significant clonal differences in the angle of growth of the secondary branches.

The selection of suitable grafting material and its cultivation is also treated.

185. SUGIURA, T. 633.75:576.312.35
 Chromosome studies on *Papaveraceae* with special reference to the phylogeny.
Cytologia, Tokyo 1940 : 10 : 558-76.

The chromosome numbers of many species of *Papaveraceae* have been determined. *P. setigerum* (a suggested ancestor of *P. somniferum*) was found to have $n = 11$, the same number as *P. somniferum*, and not $n = 22$ as previously reported.

186. YASUI, K. 633.75:576.35
 633.75:576.312.34
 Cytogenetic studies in artificially raised interspecific hybrids of *Papaver*. IX. On the bivalents-association in the meiosis of the PMC of *Papaver somniferum*.
Cytologia, Tokyo 1940 : 10 : 551-57.

Eleven bivalents of various types were observed at meiosis in pollen mother cells of one race of *P. somniferum*. Mitosis was also studied and it was possible to recognize 12 types of chromosomes, two having no exactly homologous partners. It is also suggested that *P. somniferum* is an amphitriplid, having arisen from the cross between a species with a haploid chromosome number of four and an $n = 7$ amphidiploid, this latter having been previously produced from a cross between two species with haploid chromosome numbers of four and three respectively.

187. DETERMANN, W. 633.75:581.6:575
 Über Zusammenhänge zwischen Alkaloidgehalt und Zahl und Grösse der Milchröhren in den Kapseln von *Papaver somniferum* L. Ein Beitrag zur Züchtung des Mohnes auf hohen Alkaloidgehalt. (**On correlations between alkaloid content and number and size of the latex vessels in the capsules of *P. somniferum* L. A contribution to poppy breeding for high alkaloid content**).
Z. Pflanzenz. 1940 : 23 : 371-410.

In order to limit the import of the opium poppy, chemical and anatomical investigations were made on the opium content of the strains of *P. somniferum* L. which proved capable of being cultivated in Germany.

The possibility of finding characters upon which the selection and breeding of strains with a high alkaloid content could be based was also investigated. The results showed that in the

four varieties studied there was a considerable difference in the alkaloid content of the capsule. This, however, was greatly influenced by the climate and conditions of cultivation. Anatomical research showed that while different conditions of growth slightly affected the number and size of the latex vessels in the primary vascular bundles of the capsule, the number of the primary bundles was unaffected and there was no connexion between alkaloid content and number of the latex vessels. There was, however, a relation between the total area of the latex vessels and the alkaloid content. The greater the area the higher the content. The breeding of strains with more and heavier capsules, and higher seed yield and alkaloid content is advocated.

R. M. I.

OIL PLANTS 633.85

188. BRIEGER, F. G. and
GURGEL, J. T. A. 633.853.55:575(81)
Experiencias preliminares sobre a mamoneira (*Ricinus communis*, L.)
[Preliminary researches on the castor oil plant (*R. communis*, L.)].
Rev. Agric., S. Paulo 1940 : 15 : 229-48.

Descriptions are given of the plant and of the several varieties, with data on yields, oil content and husk percentage of the seeds.

Two high yielding lines of the dwarf type have been selected. No adverse effects have been noted from inbreeding and the opinion is expressed that the plant is normally self-pollinated. Experiments to test this point are in progress.

189. 633.854.745:575(92)
Perilla-olie. (Mededeeling van het secretariaat van de Commissie voor Handelgewassen). (Perilla oil—Contribution from the Secretariat of the Committee for Commercial Crops).
Bergcultures 1940 : 14 : 768-70.

This paper discusses plant sources of oil in the N.E.I. and possibility of developing oil production from species of *Perilla* as an industry to meet the present economic needs. Attempts at cultivation as a crop in various parts of the British Empire are mentioned, and in the N.E.I. where its selection and cultivation are being studied by the *Algemeen Proefstation voor Landbouw*. Seed for trials can be obtained by those interested on application to: het Secretariaat van de Commissie voor Handelgewassen, p/a Dept. van Economische Zaken te Batavia-Centrum.

190. KLIMOCHKINA, L. V. 633.854.78:576.312.34
Chromosome morphology in *Helianthus annuus* L.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1940 : 27 : 584-86.

The chromosome complements of *H. ruderale* (the wild sunflower) and *H. cultus* ssp. *sativus* (the commercial sunflower) were studied in root tip sections. The chromosome number of both is $2n = 34$, but only 8 chromosomes of the set of *H. ruderale* are represented in *H. cultus*, the remaining 9 chromosomes of the set being morphologically different in the two species.

RUBBER PLANTS 633.91

191. 633.912:575
BÖHME, R. W. 633.913:575
Anbau und Züchtung von Kautschuk- und Guttaperchapflanzen in der gemässigten Zone. (Sammelreferat). (Cultivation and breeding of rubber and guttapercha plants in the temperate zone—Survey of literature).
Z. Pflanzenz. 1940 : 23 : 411-53.

A review of the cultivation and breeding work done on the following plants which can be used in place of *Hevea* for the production of rubber: *Parthenium argentatum* Gray, *Chrysanthmus nauseosus* Britt. et Brown, *Haplopappus* spp., species of *Asclepias*, *Cryptostegia* and *Solidago*, *Taraxacum Kok-Saghyz* Rodin, *Scorzonera Tau-Saghyz* Lipschütz et Bosse, *Taraxacum megalorrhizum* Handel-Mazzetti, *Scorzonera acanthoclada* Franch., *Chondrilla* spp., *Apocynum* spp., *Eucommia ulmoides* Oliver, and *Euonymus verrucosa* L.

R. M. I.

192.

FERWERDA, F. P.

633.912:575(92)

Gegevens tot medio 1939 betreffende de toetstuinen voor cloonen en zaaisels aangelegd in de periode 1926-1932. (Data up to the middle of 1939 on the test plantations for clones and seedlings laid down in the period 1926-32).

Arch. Rubbervult. Ned.-Ind. 1940 : 24 : 353-94.

This survey contains the results of rubber selection on the government estates in Java and Sumatra. Particulars are given of the experimental methods adopted in selection and laying out the plantations for row and plot trials and of the performance of the individual clones, seedlings and secondary clones being tested.

The technique of artificial pollination used was an adaptation of Heusser's method. Only six out of 265 clones from L.C.B. mother trees selected on the estate plantations proved equal or superior to clones such as BD5, Tjir.1 and Tjir.16 -i.e. only about 2% of the clones in the test and less than 2% of the number of mother trees originally selected. Thus it would seem that old un-selected seedling material offers but a small chance of discovering clones markedly better than existing clones now considered best and in further selection legitimate seedling families obtained by artificial cross-pollination must be used.

In addition to yields, secondary features such as wind resistance and bark renewal are recorded. In the present investigation up to 1938, 56 hybrid combinations were raised from crosses.

Yield figures for the first two test tapping years are available for about 18 hybrid families (mainly derived from L.C.B. mother trees) and show that some of these seedlings produce considerably more than clone BD5 and have reached the same level of production as Tjir.1 x Tjir.16 and A.V.157 x A.V.166 at the same age.

Observation of "seedling buddings": i.e. buddings obtained from the stem eyes of the young hybrid seedlings used to produce the secondary clones showed that they produced less than their mother seedlings in the higher yielding groups. The same relationship has been recorded elsewhere between the yields from ordinary buddings and from their mother trees. The seedling buddings however form an interesting case since buddings and parents were grown under practically identical conditions. Moreover, they differ from ordinary buddings in that the stems are markedly conical and the site of union of stock and scion so smooth that the plants could be mistaken for seedlings.

Yield data for some illegitimate clonal seedlings are also included in the report.

193.

PILAAR, C. J.

633.912:581.481:578.08

Het splitsen van *Hevea*-kiemplanten op de R.O. Pasir Koppo. (The splitting of *Hevea* seedlings on the Rubber Estate Pasir Koppo).

Bergcultures 1940 : 14 : 502-03.

A large scale test of the method already described (cf. "Plant Breeding Abstracts", Vol. X, Abst. 848) was undertaken in view of the favourable reports on the technique received from various estates. Though for the various categories of seed high percentages (120-162) were obtained for the number of surviving plants finally planted out, the writer estimates a total saving of only about 530 guilders has been realized by splitting the seedlings and against this he balances the risks involved in (1) the necessity for planting out being delayed by two months and (2) the fact that the split seeds are weaker and less resistant to effects of weather. Though it is admitted that in the present case the delayed development due to later planting out was no longer visible by the end of the year, it is emphasized that the particularly favourable and abnormally long rainy season in July of 1939 which probably counteracted the backwardness of the young plants could not be relied upon in other years. The numbers of losses were 8% for the split seeds and 2% for those not split.

194.

633.912-1.557:575.42:578.08

Selectie bij jonge hevea, op grond van den latexvloeit ten gevolge van insnijdingen in den bast door middel van een hoekig wielmes. (Selection of young hevea on the basis of latex flow resulting from incisions in the bark by means of an angular wheel knife).

Bergcultures 1940 : 14 : 582-83.

A new type of tapping knife, a modification of Dr M. L. van der Schaaff's patent with its circular arrangement of the blades, is described and its advantages as compared with other such instruments are explained. The blades are fixed on the circumference of an octagonal

wheel shaped block through the centre of which runs a wooden handle which protrudes at each side of the central block. An illustration shows its shape and dimensions. It has proved exceptionally useful at the Central and East Java Experiment Station.

195. CRAMER, P. J. S. 633.912-1.557:575.42:578.08
 Een proef met Testatex-selectie en over vroeg uitdunnen. (**An experiment on selection by the Testatex method and early thinning out.**)
 Arch. Rubbervult. Ned.-Ind. 1940 : 24 : 333-52.

Very dense plantings of young rubber trees raised from "illegitimate" seed of Avros 50 and BD5 were subjected to selective thinning on the basis of tests with the Testatex knife so that ultimately only two groups of plants (classes I and II) remained, the majority of which (at least 75%) were of the size required for the Morris-Mann test.

Estimating the relative effects of selective thinning on the basis of tree girth or yield, it is found that by the first method the average yield per tree can be increased from 12.18 grm. to 14.02 grm., i.e. 15% and by the second method from 12.18 grm. to 16.32 grm. or 34%.

The age at which trees below the Morris-Mann tappable girth may safely be eliminated as low yielders is a moot point.

The correlation between girth and yield was not very close; and a seedling which yielded best in the BD5 group was below the group average in girth. The highest yielding Avros 50 seedling gave 56 grm. The thickest BD5 trees were 49-52 cm. in girth (as compared with 33 cm. for the highest yielding) and produce only 18-22 grm.

196. 633.912-1.557:578.08:001.4
 Gewijzigde internationale standaardiseering van aanduidingen voor tapsystemen bij rubber (1940). [**The international notation for tapping systems (Revised version: 1940).**]
 Arch. Rubbervult. Ned.-Ind. 1940 : 24 : 315-32.

The new standard notation is fully explained with numerous examples of its use. For English readers an adequate summary gives all the information necessary for the practical application of the system. For Dutch readers a separate card is supplied giving the essentials of the notation at a glance.

FRUIT TREES 634

197. ALVAREZ-LAVIADA, M. 634:581.162.5
 Temas de genética frutal. La teoría de la incompatibilidad de las variedades frutales. (**Topics of fruit genetics. The theory of incompatibility of fruit tree varieties.**)
 Rev. Agric. P. Rico 1940 : 32 : 355-62.

The author outlines for the benefit of Spanish readers the work of East and the John Innes Horticultural Institution.

198. RUBTSOV, G. A. 634-1.524:581.165.711
 (Wild fruit trees as a basis of seed production for nurseries).
 Sadovodstvo (Horticulture) 1940 : No. 1 : 13-16.

The wild relatives of so many cultivated fruits are found in the forests of the Soviet Union and many of them are endowed with qualities such as tolerance of drought, frost, salt, chalk, etc. which make them extremely promising for use as rootstocks. The particular qualities of many of the most interesting species are described. Individual plants within each species vary in resistance, in time of maturity, type of growth, yield of seeds, etc. and many inter-specific hybrids occur, so that there is a promising field for selection.

199. KRJUKOV, F. A. 634-2.111-1.521.6(47)
 (Let us make use of the effect of the severe winter of 1939-40 for the selection of winter-hardy varieties).
 Sadovodstvo (Horticulture) 1940 : No. 4 : p. 21.

Temperatures of -40°C were experienced in some parts of the Soviet Union and caused considerable damage to fruit plantations and breeding nurseries. The results are being used to select the hardiest individuals.

200. RUDOLF, W. 634-2.111-1.521.6:575(43)
 Die Züchtung frostresistenter Obstsorten mit besonderer Berücksichtigung der Resistenz gegen Spätfrostschäden. (**The breeding of frost resistant varieties of fruit with special reference to resistance to late frost injury.**).

Forschungsdienst 1940 : 9 : 266-76.

The frost effects considered in this paper are confined to those affecting young shoots and leaf and flower buds. Methods of approach to the problem of frost resistance and the relations between temperature, photoperiod and dormancy as factors in frost resistance are discussed with particular reference to the conditions in herbaceous (cereals and winter rape) and woody plants (fruit trees and vines).

Since species that are frost resistant in Northern and Eastern Europe are not necessarily so in Germany or Southern Russia where renewed growth sets in too early under the milder conditions, it is important, in breeding for frost resistance, to test before use the developmental reaction of any wild species to the climatic conditions in Germany. Moreover differences in frost resistance within the species render preliminary selection essential.

The author's experiments were made to test whether the theory of the physiological conditioning of frost resistance as observed in the open could be experimentally demonstrated to be applicable to fruit trees.

By a laboratory method of freezing and thawing of flower buds of different varieties of apples and plums and at different stages of development the following results were obtained:—

Prunus spinosa was superior to its competitors in frost resistance.

As development of the buds and flowers proceeded resistance decreased markedly.

Apples too showed great differences in frost resistance conditioned by the stage of development, dormant buds again exhibiting the greatest resistance.

In breeding for frost resistance late flowering varieties are most useful. In apples, apparently this characteristic is dominant; and the inheritance of frost resistance of buds and flowers has been clearly seen in the seedlings from the cross Golden Winter Pearmain. Where extreme hardiness is not required late flowering forms of German indigenous local types of cultivated apples may be used for breeding and in many cases have the additional advantage of being genetically resistant to frost injury of the wood. Wild varieties cannot be always used since requirements as regards fruit size and quality must also be met.

The problem of combining late flowering, early ripening and high quality may not be difficult since both characteristics have been recorded in many crosses as being dominant in inheritance.

201. SODER, A. R. 634.11:575
The Soder apple.

Trans. Iowa Hort. Soc. 1939 : 74 : 35-36.

The Soder apple originated as a chance seedling from discarded apples from a storage pit in a young orchard. Rome Beauty was probably one of its parents. It is an eating apple of deep red colour, good size and attractive general appearance.

202. TSELIKOV, P. N. 634.11:575(47)
(V. A. Mokrušin, a disciple of Michurin in the Urals).

Sadovodstvo (Horticulture) 1940 : No. 3 : 21-22.

Mokrušin as early as 1915 sowed apple seeds on his estate in the Urals and by now has produced a number of varieties capable of withstanding the climate and yielding fine, large fruits.

203. SAMSONOV, I. M. 634.11:575.127.2:575.14
(The Moscow seedlings of "Bellefleur Crab").

Sadovodstvo (Horticulture) 1940 : No. 1 : 44-46.

Sixteen full grown seedlings were obtained from Michurin's variety Bellefleur Crab; 4 of them had large fruits, others medium and some had fruits little or no larger than the crab. Variation was observed also in shape and colour of fruits and time of ripening. Some of them ripen in autumn and winter and are of interest for this reason; others are of interest on account of their unusual flavour. The best are more juicy than Bellefleur Crab.

Variation occurred also in vegetative characters. The most promising seedlings are described.

204. NEBEL, B. R. 634.11:576.356.5:581.04
Inducing changes in plants with colchicine shows progress. Results obtained with flowers indicate what may be expected with fruits in time—chief difficulty is in perfecting technic.
 Fm Res., N.Y. St. Sta. 1940 : 6 : 10, 15.

Though most of the article deals with ornamentals it is mentioned that tetraploid tissue has been induced in the apple varieties Red Spy and Jonathan by treating axillary buds just being laid down with a solution of colchicine in 5% alcohol. No success has been obtained with *Prunus* species.

NUTS 634.5

205. SMITH, C. L. and 634.52:581.162.3
 ROMBERG, L. D.
Stigma receptivity and pollen shedding in some pecan varieties.
 J. Agric. Res. 1940 : 60 : 551-64.

Stigma receptivity of pecan trees was investigated by enclosing clusters of female flowers in bags made from viscose sausage casings and by pollinating such clusters using a hypodermic needle and syringe. Pollen shedding was measured by observing the male catkins. The varieties of pecan fall into two groups, one group being protandrous and the other protogynous. In no tree did the major pollen-shedding period coincide with the major receptive period of the stigmas. The time at which a variety matures its male and female flowers was found to depend to a large extent upon the time of growth initiation in the spring. Also the interval between pollen shedding and stigma receptivity in the same variety may vary from season to season.

PALMACEOUS AND OTHER TREE FRUITS 634.6

206. HORN, C. L. 634.65:581.163
Existence of only one variety of cultivated mangosteen explained by asexually formed "seed".
 Science 1940 : 92 : 237-38.

No pollen was found in the shrivelled anthers and "seed" formation is asexual, the seed originating from a cell in the epithelium of the inner integument of the ovary. It is suggested that this asexual reproduction explains the fact that the mangosteen, *Garcinia mangostana*, appears to be of one variety only.

SMALL BUSH FRUITS 634.7

207. ROZANOVA, M. A. 634.71:575.127.2:576.354.4
On genotypic differences between races of *Rubus caesius* L.
 C.R. (Doklady) Acad. Sci. U.R.S.S. 1940 : 27 : 590-93.

Meiosis was studied in the pollen mother cells of the partly fertile 21-chromosome hybrid *R. Idaeus* L. x *R. caesius* var. *turkestanicus* Regel and in the three completely sterile 21-chromosome hybrids of *R. Idaeus* with the Perm, Luga and Voronezh races of *R. caesius*. All the hybrids show 7 bivalents and 7 univalents at first division. Fusion of second division spindles and the formation of dyads was observed only in the partly fertile hybrid. Also in this hybrid ring-shaped bivalents are rarer than in the completely sterile hybrids. It is suggested that the more irregular meiosis in the most distant cross (*R. Idaeus* x *R. caesius* var. *turkestanicus*) is the reason for the production of occasional amphidiploid seeds by this F_1 .

VITICULTURE 634.8

208. ALSTYNE, L. M. van 634.835:575(74.7)
Promising new grapes: some of the best of the new red kinds.
 Fm Res., N.Y. St. Sta. 1940 : 6 : p. 12.

Brief accounts are given of the following red-fruited varieties produced by the New York State Agricultural Experiment Station, Geneva:—Goff, Urbana, Delaware, Keuka, Hanover, Hector, Yates, Ruby and Bronx.

209. SNYDER, E. and HARMON, F. N. 634.835:581.163:575.247
 "Synthetic" Zante currant grapes. Breeding investigations indicate possible origin, and point way toward production of new varieties.

J. Hered. 1940 : 31 : 315-18.

One portion of a Muscat of Alexandria vine (a seeded variety) produced clusters of seedless fruits and cuttings taken from this mutated portion showed the same character. The mutant also differed from the normal type in other characters—shorter internodes, thicker leaves and shorter leaf petioles—but was found to have the same chromosome number, $2n = 38$, as the normal type. The berries of the mutant, which are considerably smaller than those of the normal vine, produce a currant-type raisin with a Muscat flavour when dried. Currant-type seedless grapes have also been produced by breeding in recent years at Fresno, California. A single parthenocarpic seedless grape was obtained among 29 F_1 plants of the cross Muscat Hamburg x Black Monukka. Sixteen seedless plants have been obtained in the 150 F_2 plants of crosses between Muscat of Alexandria, Black Monukka, Corinthe Noir, Corinthe Rose and Olivette Blanche. In most of the above crosses a seedless variety was used as male parent but seedless plants do occur in F_2 's from crosses between two seeded varieties, e.g. from Olivette Blanche x Muscat Hamburg.

210. RODRIGUES, A. 634.835:582:581.45
 A contribuição da histologia para a resolução dos problemas taxonómicos no género "Vitis". (The contribution of histology to the solution of taxonomic problems in the genus *Vitis*).

Rev. Agron., Lisboa 1939 : 27 : 200-13.

In each species there exists a region of the petiole in which the anatomy is most characteristic. The outline of the cambium is found to be very characteristic. By projecting this on to paper and drawing the focal conchoid of the ellipse it makes, the degree of curvature can be calculated. This provides an exact method of characterizing species and hybrids.

FORESTRY 634.9

211. HEIMBURGER, C. 634.972.3:575.127.2(71)
 Report on Poplar hybridization II. 1937 and 1938.

For. Chron. 1940 : 16 : 149-60.

Results are reported of further progress in a poplar hybridization project initiated in 1935 with the aim of producing valuable hardy and disease-resistant material of rapid growth for the production of wood of high quality for industrial purposes, and of value for shelterbelts in the Prairies. It has been possible to cross the native Aspens of Eastern and Western Canada with several exotic Aspens, and their hybrids with Silver Poplar, and to obtain hybrid material of great promise for these purposes. Some Western Balsam Poplars have also been crossed with exotic species and have yielded hybrids of promise for shelterbelts. An attempt to cross an Aspen with a Cottonwood has so far yielded indifferent results. The cross of a Basket Willow with a Cottonwood was not successful. Hardiness, disease resistance, and good propagability from stem or root cuttings are at present the most important characters used in evaluating the young hybrids. (Author's summary).

212. JOHNSSON, H. 634.972.3:576.356.5:576.354.4
 634.972.3:576.356.5:577.8

Cytological studies of diploid and triploid *Populus tremula* and of crosses between them.

Hereditas, Lund 1940 : 26 : 321-52.

Nine triploid ($2n = 3x = 57$) clones of *P. tremula* have been found in Sweden. Triploids are found by examining aspens which have large leaves and it is shown that this is as good an indicator of polyploidy as large stomata and that, while both characters depend to a large extent upon chromosome number, some diploids may have as large leaves and stomata as the triploids. Triploids also have large pollen grains and many bad grains, but so also do many diploids. Of the nine triploid clones known, four are pure males, three pure females and two have not been determined. No intersexes have been found.

Meiosis has been studied in both diploids and triploids. Most diploid clones have a regular meiosis forming 19 bivalents and it is not possible to recognize sex chromosomes. In a few

clones univalents were rather common and it is suggested that these may be due to temperature changes. Meiosis in the triploid was found to be similar to that previously described by Müntzing (cf. "Plant Breeding Abstracts", Vol. VI, Abst. 1405).

Crosses have been made in both directions between diploids and triploids and the chromosome numbers of a large number of these seedlings determined. It was found that the intermediate chromosome numbers were well represented both in the cross $2x$ female $\times 3x$ male and in the reciprocal. This is in contrast to the results found in *Datura* and *Solanum* where nearly all the seedlings are diploid or nearly so. In *P. tremula* the seedlings with intermediate chromosome numbers do, however, occur with a reduced frequency from that to be expected on the binomial distribution. A number of tetraploids also were found in the progenies.

The stoma length and plant height of the diploid \times triploid progenies were also studied. On the average the aneuploids had longer stomata and were not so vigorous as the diploids. The tetraploids also were not so vigorous as the diploids but it is suggested that this may be due to their being hybrids between races with different photoperiodic requirements.

213. LINDQUIST, B. 634.975:575(48.5)
Tallens roll i svensk skogsträdsförädlings. (**The role of the pine in Swedish forest tree-breeding**).
Tidsskr. Skogbr. 1940 : 48 : 10-17, 40-46.

A note on Nilsson Ehle's investigations on the giant aspen and his work in bringing about a realization of the importance of improving the quality of timber trees precedes a description of the studies conducted by the College of Forestry to elucidate the genetical basis of branch formation by investigating variation in types of crown and branches within the pine populations in Sweden. These investigations led to a survey of the practical possibilities of improvement of the Swedish pine races.

The studies from 1933-39 on branch and crown formation showed that heritable variations in these features, so important for the quality of pine timber, are more extensive than had been thought and that narrow crowned and broad crowned races occur throughout Sweden, the former type predominating in the North and the latter in the South. Numerous transition forms of course also occur.

In many respects the narrow crowned race is the more valuable economically and some evidence seems to suggest that it may also be the more productive, though the broad crowned type apparently grows faster in its early years.

In 1938 a survey of pine stands was undertaken by the Forest Tree Breeding Association in collaboration with other interested bodies to discover suitable stands as sources for certified seed and this survey is now to be extended to cover all Sweden. Pure narrow crowned stock will be used as the source of the highest grade of seed.

Breeding by selection and by hybridization as well as by the production of forms with increased chromosome number has also been initiated. In this connexion extensive pollinations were carried out by the author in 1934 with a number of élite pines and one "giant" form is mentioned as specially promising, though it is not yet possible to say whether its progeny will inherit the giant growth habit or to ascertain the chromosome complement of the parent. At Svalöf and other sub-stations at present the progeny of about 500 pines of various types are being tested. Chromosome doubling and the possibilities of colchicine treatment as a means to this end are also receiving attention in the development of pine breeding. Possible economic changes and their repercussions on breeding for quality in pine are speculatively considered.

VEGETABLES 635

214. LAMM, R. 635.00.14(48.5)
Årsskrift från Alnarps Lantbruks-, Mejeri- och Trädgårdssinstitut 1938.
Redogörelse för stamförsök och statskontroll av köksväxtstammar vid statens trädgårdsförsök år 1937. (**Annual Report of the Alnarp Agricultural, Dairying and Horticultural Institute 1938—Report on trials of strains and state control of vegetable strains in the state horticultural trials in the year 1937**).
Malmö 1939 : Pp. 166.
575:635(48.5)

A detailed account is given of the performance of Swedish and other varieties and strains of

vegetables (and melons) in trials and observation experiments at Alnarp. (A report on local trials held in various parts of Sweden is published in a separate paper). Incidental problems cited as claiming attention as far as facilities of staff and time permitted were: vernalization applied to cauliflowers, cucumbers, carrots, tomatoes and white cabbage; the study of earliness in carrots and beetroots; winter storage properties of carrots and white cabbage; over-wintering of spinach; chemical analyses of various vegetables; a botanical and agricultural study of spinach; genetical experiments on inbred carrots and radishes; improvement of legumes and Brussels sprouts.

Work with the cross made between the two varieties of Brussels sprouts, Fest und Viel [=Firm and Many] and Odense torg [= Odense Market] is being continued.

Selection with four pea and four bean hybrids is also proceeding and selected lines from these crosses have competed in the last two years' trials.

A series of lettuce crosses have been made with the object of combining the quality of the variety New York with the light colour of Hjärter Ess [= Ace of Hearts].

Hybridization of the broad bean variety Weissbleibende von Holland [= Constant White of Holland] with "The Sutton" has also been included in the breeding programme.

A supplement deals with problems of the statistical treatment of variety trials with vegetables, yield determination receiving special attention.

215. HABER, E. S. 635.25:575.14:575(77.7)
Onion breeding.

Trans. Iowa Hort. Soc. 1939 : 74 : 246-49.

An account is given of the onion breeding work at the Truck Crops Experiment Station at Ames, Iowa. The first step in the programme is inbreeding and this is done in the greenhouse using blow flies to do the pollinating. Inbreeding has caused a loss in vigour but the inbred lines are more uniform in bulb shape, flesh and scale colour and have good keeping quality. The next step is to cross the desirable inbred lines to restore vigour and yielding ability.

216. POLIAKOVA, T. F. 635.25:576.354.46:581.036.5
Effect of high and low temperature upon chiasma formation in *Allium cepa* L.

C.R. (Doklady) Acad. Sci. U.R.S.S. 1940 : 27 : 594-97.

The effect of temperatures from 0° C. to 53° C. on the number of chiasmata per bivalent was investigated and a bimodal curve similar to that found in insect material was obtained. Changes in the coefficient of terminalization were also observed, an increase in chiasma frequency being associated with an increase in the terminalization coefficient.

217. LEVAN, A. 635.25:576.356:581.04
The effect of acenaphthene and colchicine on mitosis of *Allium* and *Colchicum*.

Hereditas, Lund 1940 : 26 : 262-76.

Acenaphthene was found to bring about the same deviations from normal mitosis, inactivation of the spindle and formation of c-pairs, as colchicine in the root tips of *Allium* (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1637). *Colchicum* was shown to be entirely immune to colchicine but susceptible to acenaphthene which produces c-mitoses and tetraploid sectors. It is also pointed out that acenaphthene acts as a very dilute colchicine solution since it is only slightly soluble in water.

218. LEVAN, A. 635.26:576.356:576.16
The cytology of *Allium amplectens* and the occurrence in nature of its asynapsis.

Hereditas, Lund 1940 : 26 : 353-94.

The cytology of normal and asynaptic *A. amplectens* Torr., a species found in the western part of N. America, is described. The chromosome number was found to be $n = 7$ and no satellite chromosomes were observed, although several chromosomes are capable of producing nucleoli. In the asynaptic forms zygotene pairing is complete but no chiasmata are formed. The univalents are arranged on the equator at first metaphase but do not divide so that there is a uninuclear interkinesis. At second division the centromeres divide and a normal anaphase produces a dyad. In the second part of the paper the distribution of the species is discussed.

219. LEVAN, A. 635.26:576.356.5:576.354.4
Meiosis of *Allium Porrum*, a tetraploid species with chiasma localisation.
Hereditas, Lund 1940 : 26 : 454-62.
 The chromosome number of *A. Porrum* is $2n = 28$. All the chromosomes have a median centric constriction and in addition 4 chromosomes have a subterminal constriction. Studies of meiosis showed that nearly every bivalent had two chiasmata, one on either side of and very close to the centromere. Quadrivalents are frequent at zygotene but very few are found at metaphase.

220. REINKING, O. A. and 635.34-2.484-1.521.6:575
 GLOYER, W. O.
Work progressing on new cabbage strains.
Fm Res. N.Y. St. Sta. 1940 : 6 : No. 2 : p. 11. [From *Exp. Sta. Rec.* 1940 : 83 : 191-92].
 Observations made on a number of yellows-resistant varieties and strains showed them to vary considerably in their degree of resistance. Attempts to isolate high-yielding, adapted types for New York State have met with considerable success, and a selection known as Geneva Resistant Seneca is considered very promising for early market and kraut manufacture.

221. NICOLAISEN, N. and 635.41:577.8
 HANOW, R.
Bestimmung der Geschlechtsverhältnisse bei Spinat. (Determination of sex in spinach).
Z. Pflanzenz. 1940 : 23 : 476-86.
 The male type of spinach plant is of little economic value, and it is important to be able to distinguish between the five types; (1) pure male, (2) predominantly male, (3) half male and half female, (4) predominantly female and (5) pure female. However, no reliable plant characteristic for the purpose could be found.
 Two strains, however, are noted, Mette's new "Fortschritt" [Progress] and Terra's "Viroflay" in which the number of male plants has been considerably reduced by breeding. R. M. I.

222. MOSKALENKO, S. S. 635.57-2.112
(*Capparis* as a conqueror of the desert).
Ovoščevodstvo (Vegetable Growing) 1940 : No. 1 : 25-28.
 Young buds of *Capparis* are used for pickles. It is capable of growing under most arid conditions and is being introduced into cultivation in the U.S.S.R.

223. YEAGER, A. F. 635.64:575.061.1
The Victor tomato.
Quart. Bull. Mich. Agric. Exp. Sta. 1940 : 23 : 3-6.
 The Victor tomato, which originated from a cross between Allred and Break O'Day, shows the determinate or self-pruning vine and much of the earliness of Allred and is recommended for trial as an early variety.

224. MULLER, C. H. 635.64:582
A revision of the genus *Lycopersicon*.
Misc. Publ. U.S. Dep. Agric. 1940 : No. 382 : Pp. 29.
 This is a comprehensive account of the genus *Lycopersicon*. Six species are recognized, two in the subgenus *Eulycopersicon* and four in the subgenus *Eriopersicon*. The two species in the first subgenus are *L. esculentum* (including the tomato) and *L. pimpinellifolium* (the currant tomato). In addition to the ordinary cultivated form, two other forms are recognized in the species *L. esculentum*—f. *pyriforme* and var. *cerasiforme* (the cherry tomato). It is suggested that most cultivated varieties of the tomato have originated from *L. esculentum* var. *cerasiforme*, although a few probably arose from hybrids of this form with other species.

225. SAFIR, S. A. 635.64-2.111-1.521.6:575(47)
(Production of frost-resistant tomatoes).
Ovoščevodstvo (Vegetable Growing) 1940 : No. 2 : 22-23.
 By repeated selection of surviving plants a tomato capable of withstanding -3 to -4°C . has been produced from the variety Sparks Erliana. The new form has fruits with few or no seeds, of excellent flavour and earlier ripening than the parent form.

226. ANDROSOVA, M. P. 635.64-2.111-1.521.6:575.125
(Cold resistance of the tomato crop).
 Ovoščevodstvo (Vegetable Growing) 1940 : No. 2 : 21-22.
 Plants obtained from hybrid seed were found to be more hardy.

227. SHAPOVALOV, M. and 635.64-2.484-1.521.6:575
 LESLEY, J. W. **Wilt resistance of the Riverside variety of tomato to both *Fusarium* and *Verticillium* wilts.**
 Phytopathology 1940 : 30 : 760-68.
 The Riverside variety of tomatoes, which originated from a cross between Cal 2 and Marvana, was found to be highly resistant to both *Verticillium* and *Fusarium* wilts in field trials (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 669).

228. SHAPOVALOV, M. and 635.64-2.484-1.521.6:575(79.4)
 RUDOLPH, B. A. **Essar—a new *Verticillium* wilt resistant canning tomato.**
 Seed World 1939 : 46 : No. 13 : 12-13.
 The Essar variety was developed by line selection for resistance to *Verticillium albo-atrum* R. and B. and canning quality in the progeny of a chance hybrid. It is highly resistant to wilt, has good canning quality and good cultural characteristics. It requires a long growing season, rich, heavily fertilized soil and a good supply of water. It is susceptible to the spotted wilt virus. Its average fruit weight is just over 8 ounces.

229. SCHAPER, P. 635.64-2.7-1.521.6:575
 Arbeiten und Probleme zur züchterischen Bekämpfung des Kartoffelkäfers. IV. Untersuchungen über das Verhalten von Tomaten gegen den Befall und Frass des Kartoffelkäfers. **(Work and problems relating to the control of the Colorado beetle by breeding. IV. Investigations on the reaction of tomatoes to attack and devouring by the Colorado beetle).**
 Z. Pflanzenz. 1940 : 23 : 454-75.
 Investigations on numerous strains of wild and cultivated tomatoes grown both in the field and in pots, showed the high resistance of all the plants to the depredations of the larva and adult beetle. The plants were most susceptible in the younger stages of growth but showed an increasing resistance as they reached maturity. R. M. I.

230. LAMPRECHT, H. 635.652:575.113.061.5:581.48
 Zur Genetik von *Phaseolus vulgaris*. XVIII. Über matte Samenschale und ihre Vererbung. **(On the genetics of *P. vulgaris*. XVIII. On matte-surface seed coat and its inheritance).**
 Hereditas, Lund 1940 : 26 : 302-04.
 Seeds of *P. vulgaris* with a rough, lustreless surface, due to the ends of the palisade cells being raised and not flat, were obtained from Kenya. The character is recessive to the normal glossy coats and the gene has been called *asp*.

231. LAMPRECHT, H. 635.652:575.113.061.6
 Zur Genetik von *Phaseolus vulgaris*. XVI. Weitere Beiträge zur Vererbung der Teilfarbigkeit. **(On the genetics of *P. vulgaris*. XVI. Further contributions on the inheritance of parti-colouring).**
 Hereditas, Lund 1940 : 26 : 277-91.
 Four crosses have been studied in *P. vulgaris* between types which have partly coloured seed coats. The cross between the *bipunctata* type (which has two spots of pigment) and the *virgata* type (which has one spot and a streak) suggested the following genetical constitutions: *bipunctata* type, *bip bip arc arc* and *virgata* type *bip bip Arc Arc*. The heterozygote *Arc arc* is more or less intermediate. Another gene, *Bip*, was found to determine the following types, *arcus* (which has an arc of pigment and a spot) having the constitution *Bip Bip arc arc* and *virgarcus* (which has an arc of pigment and a streak) being *Bip Bip Arc Arc*. Heterozygous *Bip bip* forms are intermediate between the two homozygotes. Two new genes *Diff* and *Exp* have been found to be responsible for the types *maximus*, *major*, *minor* and *minimus* (these types have a considerable amount of pigment when compared with those previously described—the *minor* and *minimus* types having only one end of the seed not pigmented).

It was found that the *Diff* and *Exp* genes increase the extension of the pigmented area when they are in their recessive state, the heterozygotes again being intermediate types in amount of pigment. It is thus possible in some crosses to obtain a gradual transition of type from *maximus* to *minimus*. The types of partly pigmented testas are illustrated by figures.

232. LAMPRECHT, H. 635.652:575.113.061.6

Zur Genetik von *Phaseolus vulgaris*. XVII. Zwei neue Gene für Abzeichen auf der Testa, *Punc* und *Mip*, sowie über die Wirkung von *V* und *Inh*. (On the genetics of *P. vulgaris*. XVII. Two new genes for markings on the testa, *Punc* and *Mip*, and the effect of *V* and *Inh*).

Hereditas, Lund 1940 : 26 : 292-302.

The character "dotting" of the seed coat (caused by coloured islands of cells in the parenchymal layer) is due to a single recessive gene, *punc*. A single dominant gene, *Mip*, produces the character "micropyle points" (the development of pigmented points near the micropyle). The gene *V* causes the seed coat colour "Pale Glaucescens" by the precipitation of fine grains in the cells of the epidermis. A recessive gene, *inh*, has been found which inhibits this precipitation.

233. ALLARD, H. A. and ALLARD, H. F. 635.652:576.312.35

The wild bean *Phaseolus polystachyus* (L.) B.S.P.: Its chromosome number.

J. Wash. Acad. Sci. 1940 : 30 : 335-37.

P. polystachyus, a wild bean of the eastern United States, which has a perennial rootstock and hypogaeal germination, was found to have a chromosome number of $2n = 22$.

234. DUNDAS, B. 635.652-2.421.1-1.521.6:575.11

A new factor for resistance to powdery mildew (*Erysiphe polygoni*) in beans (*Phaseolus vulgaris*).

Phytopathology 1940 : 30 : p. 786. (Abst.).

The semi-resistance of the variety Long Roman was found to be due to a single main dominant gene. The gene for complete resistance previously reported in field beans (cf. "Plant Breeding Abstracts", Vol. VII, Abst. 1394) has now been found in a strain of the snap bean variety Kentucky Wonder.

235. DUNDAS, B. 635.652-2.452-1.521.6:575.11

A preliminary report on the inheritance of resistance to rust (*Uromyces appendiculatus*) in beans (*Phaseolus vulgaris*).

Phytopathology 1940 : 30 : p. 786. (Abst.).

By inoculating detached leaflets of F_2 plants, the inheritance of resistance to 4 physiological races of rust has been studied. The Brown Kentucky Wonder 36928 bean contains three main independent dominant factors giving it resistance to races 1, 2 and 10 but not to race 4 of the rust. The variety Golden Gate Wax contains a single dominant factor for resistance to races 1, 4 and 10 but is susceptible to race 2.

236. DANA, B. F. 635.652-2.8-1.521.6:575

Resistance and susceptibility to curly top in varieties of common bean, *Phaseolus vulgaris*.

Phytopathology 1940 : 30 : p. 786. (Abst.).

Crosses have been made between varieties of snap and field beans susceptible to the curly top virus and the resistant varieties Burtner, Red Mexican and California Pink, in order to obtain new snap bean varieties resistant to curly top. Progeny selections in the F_4 of Blue Lake x Burtner showed strong resistance and good snap bean quality.

237. MURPHY, D. M. 635.652-2.8-1.521.6:575

A Great Northern bean resistant to curly-top and common bean-mosaic viruses.

Phytopathology 1940 : 30 : 779-84.

From crosses between Common Red Mexican (which is resistant to curly-top virus) and Great Northern U.I.1 (resistant to common bean mosaic viruses), there has been obtained a selection called Great Northern U.I.15, which is resistant to both common bean mosaic and curly-top.

GRANHALL, I.

Växtförädlingsstudier beträffande sojaböna, lin m. m. i Östersjöländerna och Mellaneuropa. (Plant breeding studies concerning soya beans, flax, etc. in the Baltic countries and Central Europe).

Sverig. Utsädesfören. Tidskr. 1939 : 49 : 161-79, 336-50.

A description of a study tour of plant breeding and improvement in Finland, Estonia, Latvia, Poland, Lithuania, Germany, Austria, Hungary, Rumania and Czecho-slovakia. Special attention was paid to the position in regard to soya beans and flax in the various countries.

LAMPRECHT, H.

Über Blüten- und Komplex-Mutationen bei *Pisum*. (On flower mutations and complex mutation in *Pisum*).

Z. indukt. Abstamm.- u. VererbLehre 1939 : 77 : 177-85.

Cases of mutations in the flowers of *P. sativum* are described. Three of them represent unpublished findings of the author. The cases described fall into two groups; one in which the mutation affects exclusively the flowers and is controlled by a single recessive gene and the other group, comprising eight cases, four of them probably identical, in which other parts of the plant as well as the flower are affected. The latter group is explained on the basis of the loss of a portion of a chromosome.

R. M. I.

635.67:575(77.7)

Outstanding sweet corn and tomato varieties at Ames in 1939.

Trans. Iowa Hort. Soc. 1939 : 74 : 93-98.

Nearly all the new sweet corn introductions of merit have been hybrids. Brief descriptions and the parentage of the outstanding hybrids for Iowa conditions are given. Ioana, a single cross hybrid produced at the Iowa station using a Bantam Evergreen inbred and a selected strain of P39, is a very high yielder and is quite resistant to smut and Stewart's disease. Other hybrids described are Tendergold, Iogold 4, Minhybrid 202, Silver Cross Bantam No. 1, Iogene 27 and Iogent 12.

635.67:575.14:575.125:575

Sweet-corn inbreds and crosses released by the Illinois Station.

Bull. Ill. Agric. Exp. Sta. 1940 : No. 466 : 279-355.

HUELSEN, W. A.

Sweet corn hybrids for canning and market released by the Illinois Station.

Circ. Ill. Agric. Exp. Sta. 1940 : No. 504 : Pp. 20.

The first bulletin summarizes the whole of the sweet corn breeding work which has now been in progress for 18 years at the Illinois Agricultural Experiment Station. The true value of single crosses was shown in two severe drought years when well-adapted crosses showed smaller variations in annual yields than open-pollinated strains. Single crosses are also much more uniform in maturity than open-pollinated strains. A considerable amount of evidence suggests that crosses will deteriorate if the inbreds are grown continuously in a more favourable climate than that for which the crosses are intended. The reasons for this deterioration are not known but examples are given of latent characters in inbreds being revealed by a radical change of climate. The breeding methods used in the selection of inbred lines and the criteria as to what constitutes a good inbred line are outlined. Eight Country Gentleman and four Narrow Grain Evergreen inbred lines have been released to seedsmen. The results of yield tests with single crosses of the inbred lines are given in three large tables. The single crosses are classified on the basis of the characteristics of their parents into three classes, compatible ("selective" female x "selective" male), incompatible (reciprocals of compatibles) and antagonistic (between similarly "selective" parents). A "selective" female inbred line is one that produces better crosses when used as a female parent than when used as a male. It was found that in numerous instances reciprocal crosses differed significantly in yields and in at least some cases this could be explained by a difference in seed size. The tendency for some inbreds to be selectively male cannot, however, be explained on the basis of seed size and is not understood. The methods of evaluating inbreds are then described and finally a description of the inbred lines, including their value in crosses, is given.

The second publication describes new Illinois corn hybrids of the Country Gentleman and Narrow Grain Evergreen varieties.

BOOK REVIEWS

BEADNELL, C. M.

5:030.8

Dictionary of scientific terms as used in the various sciences.

Watts and Co., London 1938 : 1s. 3d. Pp. ix + 235. (The Thinker's Library, No. 65).

This excellent publication, which is intended as a book of reference rather than a dictionary pure and simple, is based on information from recently published scientific books and articles by recognized authorities in scientific periodicals. Erudition and discrimination have guided the author successfully through the difficult tasks of selection, definition and, on occasion, amplification or explanation of those terms "most likely to form the subject of enquiry by students or the intelligent layman" interested in the various branches of science and recent advances in particular fields. Terms pertaining *inter alia* to Botany, Zoology, Physiology, Anatomy, Cytology, Genetics, Palaeontology, Chemistry (and Biochemistry), Psychology and Astronomy are defined with explanatory notes where such appeared necessary (e.g. under Light, Quantum, Cosmic, Life, Evolution, Electron, Cell, Azimuth, Coloration).

The arrangement and printing of the book is admirable and includes an excellent system of cross-referencing by which further information on a subject may be traced without difficulty. In spite of the limitation imposed by the format, a large number of unusual words appear to have been included among the total 6,000 scientific terms.

The book will be useful both to the initiated and the layman—though the latter may wish now and then that some indication of the pronunciation or accentuation of some of the unfamiliar or obscure technical terms had been given. The additional labour for the compiler would, however, have been very considerable.

Libraries and schools should not be without a copy even though they may already possess standard works, such as Henderson or Chambers.

The price of the edition reviewed is very moderate. A library edition is published at 5s. 0d.

TWENEY, C. F. and

5:030.8

HUGHES, L. E. C. (Editors).

Chambers's technical dictionary. Comprising terms used in pure and applied science : medicine : the chief manufacturing industries : engineering : construction : the mechanic trades. With definitions by recognised authorities.

W. and R. Chambers, Ltd., London and Edinburgh 1940 : 15s. 0d. Pp. vi + 957. figs + tables.

Encountering the term beri-berigenetic in a current periodical and doubting its authenticity, the reviewer had recourse to Chambers' Technical Dictionary. The word was not given but disappointment at this probably justified omission was fully compensated for by the discovery that pig-lug, Pinskey Gill Beds, Ptd. A., Adularescence, Adiabatic, Statenchyma, Dellinger fade-out, Belfast truss—and finally—phreatic (long sought in vain in other reference books) had all been included. Further examination of this fascinating book revealed unsuspected esoteric meanings of words as apparently simple as: canaries, miser and capitalist, or even plum or apple.

By co-operation with a large number of scientifically and technically qualified contributors the editors have assembled an enormous number of scientific and technical terms pertaining to the various pure and applied sciences and to engineering, the manufacturing and textile industries and other trades and occupations—a full list of the subjects covered fills two parallel columns on page viii.

The wealth of material to be included no doubt made it necessary to reject all but the scientific or technical meanings, as has been done for example in defining intaglio, intake (which is rather secretively defined as the Scottish term for *offset*), kill, knuckle and rigging.

The arrangement and printing are satisfactory and occasional indications of pronunciations and roots are given.

The Greek alphabet, a table of chemical elements and the periodic table and geological, zoological and botanical classifications are appended to the dictionary, with a classified list of books recommended for consultation.

The compilers and their collaborators are to be congratulated on having produced a most useful and comprehensive book of reference which will, it is to be hoped, be acquired at the moderate cost of 15s. 0d. by all public and technical libraries and scientific institutions.

ARKIN, H. and

COLTON, R. R.

519.24

An outline of statistical methods as applied to economics, business, education, social and physical sciences, etc.Barnes and Noble, Inc., New York 1939 : \$1.75. 4th ed. Pp. 224 + 47.
37 figs + tables.

The idea of the authors is to provide a "manual" on statistical methods "half way between an article in an encyclopedia and the often discursive texts studied in the classroom to winnow fundamental principles from a mass of material".

The scope of the publication is the wide field of applications to social as well as biological sciences, a program which is far too ambitious for a small manual.

The authors give a fairly complete description of statistical terms, notations and conceptions and have, in fact, compiled a useful handbook of reference which may be used as a statistical dictionary. A bias in favour of the applications to the social sciences is noticeable, modern methods of experimental design, for instance, have not been included and many of the recent results in biological and agricultural statistics have been omitted. A useful summary of statistical notations and formulae is appended followed by an extensive table of squares and cubes, and square roots. There is little in this book to teach the reader *how* to use statistical methods to draw inferences in scientific and other enquiries. Methods are merely described and apart from rather futile statements on their comparative advantages there is little to tell the reader *why*, *where* and *when* to use them.

H. O. H.

PLUMMER, H. C.

519.24

Probability and frequency.

Macmillan and Co., Ltd., London 1940 : 15s. 0d. Pp. xi + 277. Figs + tables.

The authors of most text-books on statistical methods in the biological sciences have to ask their readers to take certain results of mathematical statistics for granted. To fix the ideas pertaining to the theory of standard statistical tests, such as the t — χ^2 —and z tests, involves the calculation of tables and the derivation of formulae which are naturally beyond the scope of such books.

The present publication aims at providing a mathematical text for the benefit of those who desire to understand the mathematical foundations of statistics. Owing to a definite bias of the author in favour of the physical sciences much material on the theory of probability has been included which is not required by the research worker in the biological sciences. This applies in particular to the first part of the book. Only the last chapter deals with modern aspects of biological statistics and mathematical proofs are given for the random sample distribution of Students t , Pearson χ^2 and the sample correlation r . The book will therefore be of some help to those who, with some knowledge of higher mathematics, desire mathematical rigour but would find it difficult to consult the original papers on mathematical statistics to which they are referred by most of the existing text books.

H. O. H.

MAGUINNESS, O. D.

575

Environment and heredity.

Thomas Nelson and Sons, Ltd., London 1940 : 2s. 6d. Pp. 216. 18 diagrams, + tables.

The Discussion Books, of which this is No. 36, are stated by the publisher to be "designed for all intelligent citizens who wish to make themselves acquainted with what is going on in the modern world".

The book under review is concerned with the social implications of human heredity. The first seven chapters give an adequate account of the science of heredity for the layman and the last three deal respectively with intelligence and social class, the inheritance of acquired characters and heredity and social affairs. There is a short reading list, a glossary and an index. The cytological parts are, as usual, many years out of date but this does not radically affect the suitability of the book for its purpose. Judged by this criterion it can safely be recommended.

HUXLEY, J. (Editor).

576.12

The new systematics.

Clarendon Press, Oxford 1940 : 18s. 0d. Pp. viii + 583. figs + tables.

While few or no biologists can get on with their own line of work without the help of the

taxonomist it has become increasingly evident that taxonomists need the help of other biologists. Especially do they need the help of those concerned with the relationships between organisms, the geneticists, and of those concerned with the relations between organism and environment, the ecologists. It is the interplay between taxonomy and other branches of biology which has led to the production of the symposium before us. The symposium is of general interest, but also has a certain interest to the plant breeder, whose everyday activities demonstrate in the most convincing way the changes wrought in taxonomy and its principles by the work of biologists outside museums.

The essays to which the plant breeder will turn first are, in order of their appearance: "Mutations and geographical variation" by N. Timofeeff-Ressovsky; "Taxonomic species and genetic systems" by C. D. Darlington; "The statistical consequences of Mendelian heredity in relation to speciation" by Sewall Wright; "Bearings of the *Drosophila* work on systematics" by H. J. Muller; "The origin and behaviour of cultivated plants" by M. B. Crane and "The new systematics of cultivated plants" by N. I. Vavilov. He will find much of interest in the other articles and it is to be hoped that he will devote some critical thought to J. S. L. Gilmour's essay on "Taxonomy and philosophy". The internal inconsistencies in the particular brand of positivism which is advocated in this essay are outside the scope of this review but we cannot forbear to point out the glaring contradiction between the barely concealed idealist approach to the species as a collection of attributes and the openly materialist approach in the essays mentioned above; the static conception of species in Gilmour's essay is equally in contrast with the dynamic one evident in the essays which form the meaty part of this book. A much sounder philosophy and a much more scientific one is implicit in Darlington's essay, which explains in clear and unambiguous form what cytologists have contributed to our knowledge of the dialectical laws of change of living organisms.

The volume is sponsored by the Association for the Study of Systematics in relation to General Biology.

WILLIS, J. C.

576.12:576.16

The course of evolution by differentiation or divergent mutation rather than by selection.

University Press, Cambridge 1940 : 12s. 6d. Pp. viii + 207. 10 figs.

When the author published his "Age and Area" in 1922 his views were regarded as extremely heterodox and brought forth much, often bitter, criticism. Those were the days when Natural Selection held almost undisputed sway. Since that time the prevailing views on evolution and its mechanism have radically changed and few students would be willing seriously to challenge Dr. Willis's main thesis—that evolution has taken place in the direction from the family to the genus, species, variety, ecotype, etc. and not in the reverse direction as postulated by the Darwinian school. To the modern student therefore much of Dr. Willis's protestation will appear superfluous and unnecessarily repetitive. His argument would have been strengthened by reference to actual cases where new species are known to have arisen in nature, as for instance *Spartina Townshendii*, at one stroke, without the intervention of natural selection, and moreover by genetical and cytological processes that are completely understood; or by reference to the artificial production of already existing species such as *Galeopsis tetrahit*. In view of such existing evidence his statement on p. 89 that "as yet, the mutations that have appeared seem usually to be lethal, recessive, or non-viable, but this is no proof that viable or dominant mutations cannot appear also. If the result of such a mutation were to be found growing anywhere, people would at present say that it was another relic, and leave it at that" seems inadequate if not misleading.

In spite of possible criticisms of this nature however, the book cannot fail to be of interest to all students of evolution and of plant distribution. It brings together an imposing body of evidence in favour of the view that evolution goes on in an ordered manner quite independently of adaptation, families splitting off genera and these splitting off further genera, the genera splitting off species and the species varieties, etc. etc. as time goes on. This accounts for the fact that the oldest genera (those with the largest area) have the greatest number of species and differ from each other more sharply than the later formed, restricted genera, which consist of fewer species, often only one. This produces the famous "hollow curve" of distribution, which is quite inexplicable on the basis of natural selection and applies equally to the distribution of such things as surnames of farmers in Switzerland and is evidently the expression of some natural law.

This is the essence of Dr. Willis's argument, and the fact that he takes some 200 pages to say

it does not in itself take away from its importance as a contribution towards the theory of evolution and the origin of organized beings.

PFEIFFER, H. H.

576.3

Experimentelle cytologie. (**Experimental cytology**).

Chronica Botanica Co., Waltham, Mass. 1940 : Vol. IV : \$4.00. Pp. xii + 243. 28 figs. 13 tables. (Wm. Dawson and Sons, London).

The author treats the subject in its widest sense, the study of the cell by experimental methods, and starts by discussing the suitability of different objects as experimental material, and of different methods of technique. Cell form and the manner in which it can be conditioned and changed are discussed; there follow chapters on the structure and properties of the protoplasm, including different forms of motility, the osmotic and imbibition phenomena, permeability and the factors affecting it. Vital staining and the electrical phenomena of the cell, including the effects of different kinds of ions and of irradiation, are considered and there follows an account of the processes of cell division and differentiation, tissue culture, regeneration, mitosis and the factors that influence it, fertilization and parthenogenesis, the changes induced in the disposition of the cell contents under the influence of light, centrifuging, microdissection and other operations; experiments involving the removal of certain constituents from the cell or the introduction of extraneous material and foreign cytoplasm are also described.

In the last chapter the prospects for further advances are discussed. These, it is thought, will be made possible by further improvements in technique, by the co-operation of allied sciences and by closer interchange of ideas between specialists.

A list of selected references is appended to each chapter and the volume ends with an enumeration of the most important journals dealing with the science, a chronological table giving the main events in the development of the science from 1748 to 1939, an author and a subject index.

JOHANSEN, D. A.

578.6

Plant microtechnique.

McGraw-Hill Publishing Company, Ltd., London 1940 : 31s. 6d. Pp. xi + 523. 110 figs.

Every botanist has from time to time to examine plant material under the microscope. The need for a compendium of micro-technique is therefore as widespread as the field of botany itself. The value of such a compendium is greatly increased if the selection of techniques and the accounts given are based on a wide personal experience. Since the book under review fulfils this condition it will probably find a place in very many botanical laboratories.

The book is divided into two sections, the first on general methods and the second on special methods for the various phyla. In the first section the chapters deal with laboratory rules, apparatus, reagents, fixation, stains, staining procedures, whole mounts, the glycerin method, celloidin methods, paraffin methods, smears, cytological methods, microchemical methods and (American) sources of material. A bibliography and index are appended.

Though the author has tried hard to rationalize the subject it is evident that micro-technique has still much in common with cookery. In his attempts to judge techniques by principles rather than by results the author seems capable of swallowing a camel and straining at a gnat. For example he condemns on several occasions the use of both potassium bichromate and chromic acid in La Cour's fixatives as irrational and yet wholeheartedly commends the Navaschin type of fixative in which a reducing agent, formalin, is mixed with the oxidizing agent chromic acid. This does not detract much, if at all, from the book's value, which chiefly depends on the success of the author as a practitioner. The name Feulgen is consistently misspelt Fuelgen.

The changes which will probably strike most forcibly anybody who has been out of touch with recent developments in this field are the decline of ethyl alcohol as a dehydrating agent in favour of tertiary butyl alcohol and the disappearance of hand sectioning in favour of rotary and sliding microtomes.

GERICKE, W. F.

581.09

The complete guide to soilless gardening.

Putnam and Co., Ltd., London 1940 : 12s. 6d. Pp. xvi + 285. 60 figs. 10 tables.

Books on soilless gardening or hydroponics are now coming thick and fast, but this book is of special interest, being by the man whose name is pre-eminently associated with the development of water culture from a laboratory technique used by plant physiologists to a practical activity for amateurs and commercial growers, Dr. Gericke.

Covering all aspects of the subject, the book gives a readable, not too technical, but full account, suitable for the general public. It goes into less detail than the book reviewed in "Plant Breeding Abstracts", Vol. X, p. 252 and embodies, in a discursive way, the long experience of the author. Though erratic in regard to some of the topics raised, e.g. the matter of ρ H and the social implications of hydroponics, the book can nevertheless be recommended as an authoritative account.

632:633.1(73)

632:633.3(73)

DICKSON, J. G.

Outline of diseases of cereal and forage crop plants of the northern part of the United States.

Burgess Publishing Company, Minneapolis, Minn. 1939 : \$3.00.* Pp. vii + 259 + tables. (Mimeographed).

An account is given in a systematic way of the non-parasitic, virus, bacterial and fungal diseases of barley, maize, oats, rye, sorghums and millets, wheat, linseed, lucerne and sweet clover, clovers and soya bean. The account of each disease is in the form of brief notes, supplemented by extensive bibliographies. Varietal resistance and physiological races are mentioned and keys for the identification of physiological races are given for certain smuts and rusts. The book ends with an index and there is also a list of bacteria and fungi parasitic on the field crops arranged under orders and families, with the common hosts and reference to the page on which the relevant account appears.

The mimeographed reproduction is very clear, though a little more inside margin might profitably have been left.

TUMANOV, I. I.

632.111-1.521.6:633:581.143.26

(Physiological bases of cold resistance in crop plants).

Sel'khozgiz, Moscow-Leningrad 1940 : 7 roubles, 50 copecks. Pp. 366. 75 figs.

In this exhaustive monograph an analysis is given of the many and varied effects of low temperature on plants. These include direct freezing, damage by relatively high temperatures under snow covering, damage by standing water, by tearing out by an ice layer and by winter drought. Methods of avoiding the different classes of damage are outlined and there follow detailed discussions of the role of sugars and fats in the process of hardening. Experiments are reported in which the hardy winter wheat Lutescens 1060/10 on 19th October contained 6% of reducing sugars and 28% of sucrose whereas the less hardy variety Moskovskaja 02411 contained 5% and 15% respectively in the tillering nodes; similar differences were noted in the stem. With a further fall in temperature the proportion of reducing sugars tended to rise, e.g. on 1st December the percentage of reducing sugars was 12 and of sucrose 14 in the nodes of Lutescens 1060/10 and 11 and 13 respectively in Moskovskaja 02411; on 16th January the percentages were 19 and 11 respectively in Moskovskaja 02411 in the nodes and 16 and 2 in the leaves. On 2nd February the proportions for Lutescens 0329 were 8 and 3 in the leaves and 13 and 8 in the nodes, whilst in Kooperatorka the figures were 3 and 1 in the leaves and 6 and 3 in the nodes. From these and the figures of other authors it is clear that the accumulation of sugars during cooling is more pronounced in frost-resistant than in tender varieties. In one experiment a hardy variety, Minhardy, has been reported with as much as 32% sugar after hardening, a susceptible variety Zemka having only 22% under the same conditions. Before hardening the sugar contents of the two types may be the same and even after cooling under certain favourable conditions the sugar content of tender varieties may occasionally be equal to that of hardy forms and spring forms may be as high as winter forms. It would appear therefore that sugar content is not the sole factor concerned in frost resistance. It is in the second phase of hardening, characterized by loss of water by the plant during chilling, that the most pronounced difference is noticeable. Artificial loss of water by wilting increases the concentration of the sugars present but, though causing a certain rise in hardiness, does not produce anything like the effect of the water loss in the course of hardening. This process appears to involve an actual association of the sugars with the protoplasm, which in resistant varieties takes place to a greater extent than in susceptible—the proportion of bound water is greater. Hardened cells were moreover found to be capable of supporting a greater pressure of ice without being damaged. Hardening increases the permeability of the protoplasm so that the ice tends to be formed in the intercellular spaces; and hardy varieties alter more than susceptible varieties.

*The publishers request that owing to war conditions remittances from countries outside the U.S.A. should be made in advance.

The sugar solutions exercise their protective action by their capacity for supercooling, oils by their incapability of freezing.

The influence of day length on hardiness in trees is discussed; it is found that the action of short day alone is not sufficient to induce hardiness and that a period of hardening is also necessary. Vernalization entirely destroys cold resistance since it inhibits the plant's capacity for hardening in the second phase. There is no direct correlation however between hardiness and the length of the vernalization stage.

Both the first and second phases of hardening are reversible, the second even during a brief thaw of 2-3 days. Experiments are cited in which 36 resistant winter wheat selections withstood -12° C. after 3 days thaw but were all destroyed by this temperature after 5 days thaw. The influence of manuring, grazing and grafting on hardiness is examined and the conclusion reached that the only satisfactory way of arriving at resistance is to breed resistant varieties. Michurin's work with fruit trees is outlined as an example and mention is also made of the work of Canadian fruit breeders, and of the production of frost-resistant wheat-rye hybrids, though these are said to be far from providing a solution of the problem. Cases of the successful production of hardy cereals by crossing within the species are also reviewed.

The effects of frost damage and the processes of regeneration are described. The merits and demerits of the field method of estimating frost resistance are discussed. Alternative methods considered are: removal of the snow covering, artificial freezing in boxes, and various indirect methods. These latter are mostly unsatisfactory, since properties such as the sugar content, though related to resistance, are never the sole cause of it. Particularly the second phase of hardening is impossible to estimate by indirect methods. Descriptions are given of various types of cooling chambers used with success in the U.S.S.R. and elsewhere. At present the author uses a method of freezing the plants after removal from the soil, based on the principle of phasic hardening. The first phase is accomplished while the plants are in the field at a temperature below -6° C. They are then removed without breaking the tillering node. The plants are labelled and tied together in bunches of 20 to 25 and left to pass the second hardening phase at -3 to -4° C. for 3 days. The temperature is then lowered to the degree it is desired to test. Some of the plants may then be removed and the temperature lowered further and so on. The tested plants are kept through the winter by planting them in heaps of moist sawdust. Similar methods have been applied to newly germinated seeds and with cuttings of fruit trees. Methods of estimating other forms of winter damage are also discussed.

An analysis is made of the relative hardiness of the different crops and of their varieties. Rye is the hardest of the cereals and Elishevskaja and Avantgarde its hardest varieties; both are products of individual plant selection from local strains, as also are Vjatka, another popular hardy variety, Nemyšljanskaja and a number of others whose merits are discussed and compared with those of varieties produced in other countries. The range of variation in hardiness in winter rye is very wide, the lethal temperature being from -10 to -30° C. according to variety. The range for winter wheat is -10 to -23° C. Tests have been carried out on the whole U.S.S.R. world collection of winter wheat and the varieties found to be most frost-resistant are enumerated, the list being headed by Lutescens 0329, a selection from the variety Sandomirka. Indications are given of the main characteristics of the varieties and of their origin and the merits of the hardy varieties of many other countries as compared with the Russian varieties are discussed at length. The hardest varieties are not the highest yielding and vice versa and one of the main problems for breeders is to combine frost resistance with high yield. Resistance to death at moderate temperature under the snow layer is correlated with the length of the thermo-stage of vernalization; certain varieties that have proved resistant in this way are mentioned.

Similar observations, though on a smaller scale, have been made on other crops, including winter vetch, barley, oats, perennial forage crops (yellow and blue lucerne, clover, various grasses), and also on fruit crops, Michurin's hybrids having given the best performance, e.g. in apples, pears, cherries, plums, peaches, apricots, vines, raspberries and strawberries. Brief data are given also on walnuts, olives, figs, guayule, tea and the citrus fruits.

The range of variation in hardiness in spring sown crops is much less, many of them being incapable of effecting the second phase of hardening. One of the most resistant is spring wheat and data are given on the reaction of different varieties, followed by similar data on barley, oats, peas, flax, sunflower and potatoes, including some of the new species from South America; also cotton, various weeds, plant parasites and fungi.

The volume terminates with a selected bibliography and index.

KERR, H. W. and
BELL, A. F.

633.61(94.3)

The Queensland Cane Growers' Handbook.

Bur. Sug. Exp. Sta., Dep. Agric., Brisbane 1939 : Pp. vii + 199. 136 figs.
6 pls.

This book is a first attempt to place in the hands of Queensland cane growers a comprehensive treatise on all the major subjects which should interest them in the production of their cane crops. The first chapter describes the morphology and anatomy of the sugar cane. In the next ten chapters soils, fertilizers, irrigation and crop cultivations are discussed. Chapter XI has the title, "Cane varieties and cane breeding". A short account is given of the technique of cane breeding and there is a list (containing notes on the origin, the date of introduction, growth and reactions to pests and diseases) of the more important varieties grown in Queensland. The last two chapters deal with diseases and insect pests.

BRITON-JONES, H. R.

634.61-2

The diseases of the coconut palm.

Bailliére, Tindall and Cox, London 1940 : 10s. 6d. Pp. xvi + 176. 37 pls.
4 diagrams.

The object of this book is to give to growers and agricultural officers a simple account of the diseases of the tall coconut palm. The descriptions and accounts of the diseases are mainly based on the author's experiences in the West Indies (particularly Trinidad and Jamaica), but there are many references to the work of mycologists in other tropical regions. Recommendations for controlling the diseases are considered and the suggested remedies are critically examined, especially as to their cost.

In the first chapter the author considers the "Bud Rot" complex and splits it into four separate diseases—Bronze Leaf Wilt, *Phytophthora* Bud Rot caused by the fungus *P. palmivora*, Tapering Stem Wilt or Pencil Point Disease, and Red Ring Disease caused by the eelworm, *Aphelenchus cocophilus*. None of the component diseases is considered to be due to bacteria. Bronze Leaf Wilt is caused by a combination of physiological factors, the most important of which appears to be insufficient soil moisture. Tapering Stem Wilt is also due to soil conditions, the chief cause probably being the poverty of certain soils in organic matter and in inorganic food materials. The author suggests that the palm *Chrysalidocarpus lutescens* might be useful as an index plant for physiological investigations, since it is difficult to work with the unwieldy tall coconut palm itself.

After the four chapters on the components of the Bud Rot complex, the author discusses in the five following chapters, False Wilt and Lightning Strike, the Stem-Bleeding disease caused by *Ceratostomella paradoxa*, root diseases, leaf diseases, gumming disease and dropping of nuts. False Wilt appears to be due in the first place to the rupture of the tissues at the bases of the leaves by heavy rain storms and the author suggests that palms differ in the strength and the liability to rupture of their leaves. Lightning Strike is considered to be very important in Ceylon and Malaya.

The book is illustrated by 37 full-page plates of a very high standard and there is a bibliography of about 250 references but no index. The book is obviously one of importance to all interested in coconut palms and provides a very useful summary of the present knowledge of the diseases of the palm. The author also points out that there is still much work to be done and makes suggestions as to the type of work needed on the several diseases.

NEW JOURNAL

Indian Farming.

The new monthly journal, *Indian Farming*, the first number of which was published in January, 1940, appears in place of *Agriculture and Live-stock in India*, which used to appear every two months. The new journal has, however, a different aim from the old, being designed for what the Americans call extension work, that is the dissemination to the farming community of the results of agricultural research. The appearance of the journal is attractive and it is well illustrated by excellent photographs. Articles dealing with plant breeding have already been reviewed in *Plant Breeding Abstracts*. [Issued by the Imperial Council of Agricultural Research, India. Prepayable subscription Rs.6 or 9s. 6d. per annum. Price of single copy As. 8 or 9d. inclusive of packing and postage (in India)].

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